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AN ECONOMIST'S VIEW OF RICE AND CORN IMPROVEMENT [1]

C. A. BRATTON [2]

A man views a thing in the light of his own experience. In our program this week we have heard from scientists on different phases of rice and corn work. The plant breeder has looked at rice and corn improvement from one angle, the pathologist from another, the soil conservationist from still another, and so on with each specialist. Now we come to the economist's view of rice and corn improvement.

You might ask: what interest has an economist in rice and corn improvement? Why should an economist's views be brought before this group? The answer is that much of the progress which agricultural economists, especially farm management men, are striving for depends on the improvements developed by the workers in the various plant science fields.

On the other hand, most scientific workers are interested in the economic importance of their endeavors. An understanding of the true value of one's efforts usually adds zest and enthusiasm to the doing of the job. Thus it is assumed that this group is interested in some of the economic implications of rice and corn improvement as they apply directly to the Philippines and indirectly to the world situation.

To get a view of the economic importance of rice and corn improvement, let us examine a few pertinent facts. These facts will be considered in three general parts as follows:

1. The present situation
2. Our basic problem
3. Solving the problem.

THE PRESENT SITUATION

Improvements can be made only by starting from where we are. Let us briefly review a few economic facts concerning this country.

The Philippines has long been known as an agricultural country. In recent years the Republic has been developing in other fields such as mining, manufacturing, and trade, but it is still predominantly agricultural.

Of the total population, about three-fourths live in rural areas. In 1939 the census reported 70 per cent of the male workers as engaged in agriculture. The 1948 census figures on employment are

[1] General Contribution No. 864. Read at the Rice and Corn Improvement Training School, U P College of Agriculture and Central Experiment Station, Los Baños, Laguna.

[2] Visiting professor of agricultural economics from Cornell University.

not yet available. The percentage may be down somewhat, but it will still be a large portion of the total.

For the year 1950 the gross national product of the Philippines was estimated to be 5.1 billion pesos. Of this, 2.6 billion or 52 per cent was contributed by agriculture. Of the total value of exports for 1950, 92 per cent was from agricultural products.

Thus, when considered from the standpoint of the number of persons living in rural areas, the number employed in agriculture, the gross national product, or the value of exports, the Philippines rates as an agricultural country.

The leading crops produced in the Republic include rice, corn, coconuts, sugar cane, camote, and abaca. Farms were classified on the basis of type in the 1948 census, and 48 per cent, or about one-half, were palay or rice farms. Corn farms were the second largest class of 16 per cent. Rice and corn farms thus comprised nearly two-thirds of all farms.

Another way of evaluating the relative importance of the different farm crops is by examining the area planted to each. Again using the 1948 census data we find rice and corn to be the two leading crops:

CROP	AREA PLANTED IN HECTARES	PERCENTAGE OF TOTAL
Palay:		
Lowland	1,183	32
Upland	392	11
Corn	526	14
Abaca	237	6
Camote	178	5
Sugar cane	84	2

These figures represent the area used for first crops only and do not include second and third crops. Lowland rice was first in importance and accounted for about one-third of the total cultivated area. The area devoted to corn was greater than that used for upland rice. When combined, rice and corn made up 57 per cent of the total cultivated area.

Estimating the value of the crops produced is a third way of gauging their relative importance. Below is a table showing the proportionate values of the crops produced in 1948:

CROP	PERCENTAGE OF TOTAL
Rice	46
Coconuts	26
Corn	7
Sugar cane	6
Abacá	3
Others	12

Again rice was the most important; coconuts, second; and corn third. Rice and corn combined made up 53 per cent of the total value.

Rice and corn, by any common measure which an economist might use, stand out as two important crops. Considered strictly from the standpoint of food production for the Filipino people, they are even more important than what the figures we have examined indicate. From the viewpoint of an economist rice and corn are the leading food crops and merit the greater attention of the crop scientists.

Even though the Philippines is an agricultural country it is not self-sufficient in rice. After liberation large quantities of rice had to be imported. With the rehabilitation of farms, the production has steadily increased until the country is now near the point of being self-sufficient. It is anticipated that there may be a small surplus for export in the immediate future.

Compared to the rice yields of other countries, Philippine yields are in the low bracket. According to data compiled by the Food and Agriculture Organization for 1951, Italy has a yield four times that of the Philippines, Japan has more than three times, and Taiwan has more than twice. Only India and Ceylon have lower yields than the Philippines.

Yield is an important factor affecting costs. It has been claimed that the Republic can import rice at a lower price than what it costs to produce rice in this country. This situation presents a challenge to Philippine agriculturists. We must improve rice production here to be able to compete favorably with other countries of the world.

What is the economic status of the individual rice farmer?

There are more than one million farmers producing rice. Of these about 750,000 produce lowland rice and 350,000 produce upland rice. In 1948 the lowland rice farmers produced 36.5 million cavans of palay, and the upland farmers produced 6.5 million cavans.

Rice farms in general are small in area. The average size of rice farms in 1948 was 3.1 hectares. One-half of the rice farmers, however, had less than 2 hectares. An examination of the tenure shows that 60 per cent of the rice farmers are tenants, with 45 per cent renting all the land they operate and 15 per cent owning part and renting part of their land.

A tenant farmer with 2 hectares of rice yielding 30 cavans each would produce a total of 60 cavans. If he is on a 50-50 share arrangement he would get 30 cavans for his half, minus 5 cavans for the harvesters. His final share would be 25 cavans, which when milled would be 12 to 13 cavans of rice. An average family of 5 to 6 persons, each person eating 2 to 2½ cavans of rice a year, would need from 10 to 15 cavans for its use. So we can readily see that these farmers are barely producing enough rice for their own use and have none to sell to get cash for other living expenses.

This appraisal of the situation has been borne out by recent economic studies. One study showed that only one farmer in 10 actually had any rice to sell. Current studies also show the general situation.

Let us examine the findings of six studies of rice farms made by the College of Agriculture for the years 1947, 1948, and 1949. Records were taken from farmers in selected barrios in good rice-producing areas of Luzon. A total of 855 farms was included in the study.

The size of the farms in these six barrios averaged 2 hectares, with practically all of the land in rice. Sixty per cent of the farms, however, were less than 2 hectares. The average yield to a hectare for the six areas ranged from 35 to 99 cavans of palay, and the over-all average was 53 cavans to a hectare. The average price of palay was ₱14.23. Thus in these areas for this period yields were better than average and palay prices were reasonably good.

Let us look at the finances of these farmers. The receipts averaged ₱750 and the cash expenses, ₱130 a farm. The operator's labor earnings, which include the value of farm products used by the family and the value of the dwelling, averaged ₱640 a farm, or about ₱50 a month. Thus the incomes of these farms were low even with yields twice the national average and with good prices.

Living conditions of the 855 farmers studied, as measured by the facilities available in the homes, were rather meager. Only 23 per cent, or less than one in four houses, had metal roofs. Only one in five had a water container with faucet, and one in four had a sewing machine. Of the 855 farm families only 38 had bicycles, 33 had electric lights, and 22 had radios. More than one-third of the families had no reading material in their homes. These facts give us a brief indication of the economic status of the rice farmers in these six areas of Luzon.

OUR BASIC PROBLEM

Mankind in general is interested in improving his food and his general well-being. This has been true from the earliest primitive times down to the present day. Economists refer to it as the desire to improve the standard of living.

The Philippines enjoys a higher standard of living than many of the Oriental countries. Filipinos have not been faced with famines as some peoples have been. This country is rich in natural resources and has made progress in many lines such as education and health. Yet we find that the standard of living is low for many Filipinos; some of the people are discontented, and they are demanding a better living. How can this be accomplished?

A simple economic principle which is sometimes forgotten is that one cannot consume more than one produces. The only way to per-

manently improve the standard of living of any country is to increase the total output or production. Ways must be found whereby all workers, both agricultural and urban, can produce more. Some persons seem to think that one can legislate higher consumption. One cannot legislate a high standard of living.

Greater production to a man is not easy to accomplish. Many things are involved. I propose to discuss briefly two phases only: first, industrialization; and second, ways for each farmer to produce more.

Industrial development is important from several angles. If the general standard of living is raised, the Filipino people will want many things in addition to more and better food. They will demand industrially made products, such as radios, electric lights, cigarettes, shoes, and better clothes. These things may be imported, but many of them probably can be made cheaper here. Also, in order to import, a country must have goods to export. The world market demand for farm products produced in the Philippines is limited. Industrialization also is needed to provide employment for surplus farm population. There is a labor surplus on farms at present, as most of us have observed while passing through the barrios.

Industrialization and surplus farm population are interdependent factors. Farmers first improve their efficiency to the point where they produce more than enough food for their needs. When this is done, some farm workers are released from producing food and become available for work in industry. Industry must develop fast enough to provide employment for the workers released from farming, or unemployment develops. The present unemployment in the Philippines indicates that industrialization is lagging.

Some persons suggest that there is no need for improving farm methods and increasing the output of each worker as long as there is a surplus of farm workers. This is erroneous reasoning. Greater output to a farm worker is needed along with industrial employment opportunities so that there will be a greater total production for the nation and a higher standard of living for Filipinos.

Mechanization is often proclaimed as the means to give the Philippines a higher standard of living. As an economist, I will grant that mechanization is one way of increasing output to a person. It must be remembered, however, that industry is basic to mechanization. Industry is needed to produce the machinery and to provide employment for the workers released by the use of more efficient machines. In the Philippines some farm mechanization is desirable, but it can come about on a sound basis only as fast as industry provides employment for the workers released by the use of machines.

Individuals generally are interested in how to increase their income or earnings and, as consumers, in how to buy goods at lower prices. Workers strive for larger salaries, farmers look for larger

net returns for their crops, and consumers ask for lower prices for rice and other articles they buy. Are these two things incompatible? The answer is no!

Greater efficiency, for example, in the production of rice will give greater output to a man and lower cost of production. The saving in cost of production is usually shared by the producer and the consumer in the form of somewhat higher returns for the farmer and somewhat lower prices for the consumer.

SOLVING THE PROBLEM

The economic principle is clear: greater output to a farm worker is essential for a higher standard of living. The real problem is finding the key to getting greater output to a worker, and here we are concerned with the problem of getting greater output to a rice and corn farm worker.

How can a farmer produce more? There are several possibilities:

1. Work harder.
2. Adopt better work methods.
3. Use improved crop practices.
   (a) Better seeds
   (b) More fertilizer
   (c) Proper cultivation

A man can produce more if he is willing to work harder or longer. Working harder has little appeal for most people. Here in the Philippines there is a real possibility for changing the production of the farm business so that the farmer will have *productive* work for 12 months of the year instead of six to eight as is common now. This is a problem for the farm management specialists to tackle.

The second point, the adoption of better work methods, has more appeal than the first. It is essentially a matter of finding an easier way of doing things. Better work methods might mean the development of adapted equipment, such as a more efficient carabao plow or a simple thresher, which is a job for the agricultural engineers. It also might mean finding a better way of doing the job with the same machinery. This is a job for the work simplification specialists who are usually farm management specialists and agricultural engineers.

The third way, the use of improved crop practices, involves such things as better-adapted, high-yielding seeds, more and better-adapted fertilizers, and proper cultivation, along with the use of irrigation, insect and pest control, and many others. From the economist's point of view, it is by using improved crop practices that those working on rice and corn improvement can make a real contribution toward increasing the output of every farmer and raising the standard of living of all Filipinos.

Both producer and consumer are concerned with the cost of production of any item since it affects the returns of the producer and the price paid by the consumer.

Economic studies have long shown that high yields are associated with low cost of production and low yields with high cost of production. Work done at the Central Luzon Agricultural College revealed that for a yield of 27 cavans a hectare, which is the Philippine national average, the cost of production was ₱15.29, whereas for a yield of 60 cavans, which is about the national average of Taiwan, the cost was less than one-half, or ₱7.12. The same general relationship was observed in six studies made by the UP College of Agriculture. For the area with an average yield of 36 cavans a hectare the cost was ₱10.77, as against ₱8.30 for the area with a yield of 50 cavans and ₱7.75 for the area with a yield of 60 cavans.

Numerous studies in other countries and for other crops support this relationship. In general, it can be said that high yields tend to give lower costs to a unit.

Workers must always be cost conscious when they set out to get higher yields. The costs in obtaining the increased yields can become so high that the cost to a unit is increased instead of decreased. This situation is simply the functioning of the law of diminishing returns. It is suggested that in our rice and corn improvement work we always keep alert to the cost to a unit of production.

That scientific "know-how" is already far ahead of farmer application is commonly recognized. The extension and agricultural education workers are striving to shorten the gap between the time of scientific discovery and the time of application by the farmers. Research workers also need to be alert to possible ways of getting their findings adopted by the farmers. There is apparently a great need for better farm management in the Philippines.

Science develops slowly, and so the scientists must keep well ahead of the farmer. Hybrid corn, which has been championed by the agronomist in many parts of the world, required many years to develop. Reliable scientific "know-how" comes about only after long years of repeated hard work. The projects you are starting now may be the ones which will be used to solve problems arising in 1975 or the year 2000.

The fact that there is a lag in the adoption of new approved practices is no reason for the rice and corn improvement workers to rest on their laurels. There are great pressures which make imperative the continuous advancement of rice and corn scientific "know-how."

The demand for a higher standard of living as expressed in better diets places pressure on the need for rice and corn improvement. Some persons could use more rice and corn inasmuch as they do not have as much food as they would like to eat. More rice and corn production is also needed to make the country self-sufficient in these basic foods. This would be especially important in case of another world war.

Better diets usually mean the consumption of more meat and livestock products. More feed grains, which come principally from rice and corn, will help to feed more livestock. Rice and corn improvement can mean more rice and corn, which will feed more livestock, which will provide more meat and eggs, and which in turn will make a better diet for the Filipinos.

A second and possibly even a greater pressure from a long-term point of view is the rapidly growing world population. The world population at present is increasing at the rate of 20 million persons a year. This is the equivalent of adding each year a country the size of the Philippines to the number of people in the world who must be fed. This means a continuing growth in the world demand for foods including rice and corn. If in the future the Philippines expands its rice and corn production beyond domestic needs, it can undoubtedly find a ready export market for the surplus, provided that the cost of production is comparable with that of other countries.

Growth of the population of the Republic is another pressure to be recognized. In the last 10 years the Philippine population has increased by one-fourth. It is estimated that by 1970 the population will reach 32 million and by 2000 it will reach 64 million. This clearly means a growing demand at home for food crops of which rice and corn are the staples.

These economic pressures bear heavily on the plant scientists. Do we have the trained personnel and is our scientific research program moving ahead fast enough to meet these pressures?

An economist's view of rice and corn improvement might be summarized by saying that such an improvement is extremely important for the advancement of the standard of living of the Filipino people. It can contribute much to a lowered cost of production which will benefit both farmers and consumers. When combined with improvements in other fields like marketing, credit, health, roads, and education, it will go far in keeping the Philippines in the lead in the economic development of the Orient.

COMMERCIAL-SCALE POULTRY PRODUCTION IN CEBU [1]

AMADO C. CAMPOS

The Bureau of Census and Statistics, in its report dated January 1, 1951, ranks Cebu as the foremost chicken-raising province in the Philippines. Of the 28,054,900 chicken population of the entire archipelago in 1950, Cebu raised 2,288,670, or 8.2 per cent.

Cebu chickens and eggs have always been widely sold in Manila markets. Fronda [2] reported in 1931 that about 50 per cent of the total number of chickens sold in the Divisoria and Quinta markets of Manila were "Cebu" chickens, although not all actually came from that province. Since freighter boats started to operate between Cebu and Manila after the war, the flow of Cebu poultry products to Manila has been continuous. The quantity shipped is so great that it influences the prices of table fowls and eggs in Manila.

These facts about Cebu's poultry trade are signs which indicate that this island province possesses favorable conditions for poultry raising on a commercial scale. To determine the extent of these possibilities, a survey was made from May 10 to May 26, 1952.

METHOD OF STUDY

Trips were made to a number of municipalities and barrios for the necessary data. Flock owners, grain farmers, hucksters, market vendors, poultry feed and poultry medicine dealers, government agricultural extension agents, and poultry exporters were approached for information regarding the climate and topography of the province, crops grown, kinds of chickens raised, systems of flock management, housing practices, feeds and methods of feeding, prevalent poultry diseases and pests, system of marketing poultry and poultry products, and prevailing prices of poultry feeds and poultry products.

DISCUSSION OF FINDINGS

Location and climate. Cebu lies at about the center of the Visayan Islands. To the north are Masbate and the northern strip of Leyte, to the east are the rest of Leyte and the whole of Bohol, to the west is Negros, and to the far south, Mindanao. Cebu City, the biggest port of the province, is approximately thirty-six sailing hours from Manila, three hours from the nearest port of Leyte, four hours from Tagbilaran, Bohol, three hours from Dumaguete, Negros Orien-

[1] General Contribution No. 865. This study was made possible by a grant from the PHILCUSA-FOA as part of the aid to research programs of the Central Experiment Station.

[2] F. M. FRONDA, *Philippine Agriculturist*, 20, 388 (1931).

tal, and about six hours from Mindanao shipping points. According to the climatic map of the Philippines published by the Bureau of Coast and Geodetic Survey in 1925, Cebu possesses a mild climate with no pronounced maximum rain period and no prolonged dry season. On the whole, the location and mild climate of the province favor chicken raising.

Topography. A long narrow island of approximately 486,850 hectares, Cebu is hilly and mountainous. The land is generally rocky, being of white limestone and coral, except for the small areas of flat ground along the coast which are of either sandy-loam or clay-loam soil. The soil is rather loose; because of the rolling contour of the land, it is very easily drained. A network of good roads traverses the whole province. Almost all the towns are connected with either first- or second-class roads which add to the ease and convenience of transporting farm products. The favorable topography of the land and the fine roads contribute towards making Cebu a suitable place for raising poultry.

Crops raised. Cebu farmers practice diversified farming. Their major crops are corn, coconuts, sugar cane, and tobacco. Their minor crops are maguey, abaca, and kapok. Very little rice is grown and corn is the staple food. The corn generally raised is the White Flint variety. Because the northern part of the province is not as rugged as the south and the soil is not as rocky, more and better crops are raised by the farmers in the north than in the south.

Kinds of chickens raised. Native or "Bisaya" fowls and standard-bred fowls are raised in Cebu. The "Bisaya" fowls are more in number and are found on most farms and in backyards of some barrio and town residences. They are more or less self-supporting. The "Bisaya" fowls resemble the Indian Game Fowl and the wild Jungle Fowl in appearance and size. Although small, they have broad, meaty breasts. They have no uniform color pattern, although black seems to be their predominant color. Bearded chickens, or those with beards and crests like the Houdan breed, are not unusual. Kept in a semi-wild condition, native chickens are nervous in temperament. In spite of their undesirable features, these chickens are preferred by the Cebu farmers because they are hardy and can better stand neglect. Native fowls predominate in the Cebu markets.

The standard-breds are mostly Single Comb White Leghorns and New Hampshires, with a few Australorps, Rhode Island Reds, Barred Plymouth Rocks, Jersey Black Giants, and Game breeds (commonly called Texas). They are generally raised in a more business-like way in backyards of city and town residences. The birds seen at the time of the study were descendants of those imported by the government from the United States after the war, although a few were claimed to be of recent importation by private poultry enthusiasts.

Many poultry establishments kept standard breeds at the time of the survey. A census made by the Office of the Bureau of Animal Industry indicates that as of April 2, 1952, 37,416 S.C. White Leg-

horns, 16,234 New Hampshires, and 27,323 of the other breeds were being raised in the various poultry projects in Cebu City and in the different municipalities of the province as follows:

MUNICIPALITY	NO. OF POULTRY PROJECTS
Cebu City	133
Algeria	1
Aloguisan	1
Asturias	3
Bandian	3
Balamban	14
Bantayan	6
Barile	9
Bogo	7
Boljo-on	1
Carcar	6
Carmen	1
Catmon	4
Compostela	3
Consolacion	1
Cordoba	2
Daanbantayan	3
Danao	6
Liloan	5
Malabuyoc	1
Mandaue	9
Medellin	3
Minglanilla	10
Moalboal	1
Naga	7
Opon	1
Pinamungajan	2
Samboan	2
San Fernando	7
Sibonga	2
Sogod	5
Tobogon	1
Talisay	12
Toledo	5
Tuburan	3
Total	290

The above data show that most of the organized flocks are in Cebu City and its surrounding towns. This is explained by the fact that those who raise standard breeds, a few of whom are Chinese, generally belong to the moneyed class residing in centers of population. These flock owners raise chickens generally as a paying hobby.

S. C. White Leghorns are preferred to the other breeds because they have proven to be better producers of good-sized eggs which easily command a good price among the discriminating egg consumers of the province. A number of flock owners, however, prefer the New Hampshires to the S. C. White Leghorns because New Hampshires, in addition to being fairly good producers of large-sized eggs, also make good broilers and fryers for the consumption of the rich people of the city. The other breeds like Rhode Island Reds, Australorps, Barred

Plymouth Rocks, Jersey Black Giants, and Games are raised principally as curiosities and for sport.

Management practices. The majority of the native chickens are raised on unfenced areas; only in rare instances are houses specially built for them. Chickens roost on branches of trees or on improved perches under the owners' houses. No system of breeding is followed. The birds are allowed to mate and multiply freely among themselves. It is not unusual to find almost equal numbers of roosters and hens in some flocks, although the general practice is to market cockerels before they reach breeding age or to separate the promising ones for cock-fighting, leaving more females than males in the flock. Very little attention is paid to culling or selection. Whatever selection is done is made on cockerels, based principally on their fighting qualities; that on hens is based on their ability to incubate eggs and brood and wean chicks. Culling takes place any time of the year depending on the financial need of the flock owner; it is usually done during the planting season when the owner-farmer has to meet his financial obligations.

The standard-bred fowls are better managed than the native ones. They are housed in shabbily made sheds of nipa and bamboo or in more expensive houses of wood and galvanized iron, depending on the enthusiasm and capital of the flock owner. The types of poultry houses vary from shed to gable to semi-monitor. Since most of the organized flocks average about a hundred birds each, the gable type is mostly used. Flocks in the city are raised either on wire or on litter; those in the municipalities, mostly on dirt litter. The litter material used is either sawdust or sand, since rice hull is not easily obtainable in the province. Although most flocks are closely confined, several have yardings with lawn grasses to serve as green feeds. In one of the farms visited the birds were kept on a wire flooring and yet were provided with yardings. According to the owner, the birds are kept on wire during the rainy months and are given the freedom of the yards only during summer when the hazards caused by diseases and parasitic organisms thriving on the ground are less.

The open nest is widely used. A few poultry houses were provided with trapnests, but at the time of the study these nests were no longer in operation. Because of the constant attention and the tedious work involved in keeping track of the egg production of each bird, the trapnesting of layers for record purposes has been abandoned. None of the poultry establishments keep layers in individual laying cages. Standard-bred chicks are hatched mostly by machines. Various types of incubators are used although the locally made, small-capacity, kerosene incubator is predominant. Candling is done with improvised electric candlers. Chicks are raised generally in heated battery brooders. Whether in the brooding, rearing, or

management of laying flocks, every raiser of standard-bred fowls follows the recommended methods.

Feeds and feeding practices. Very little attention is given to the feeds and the system of feeding of the native birds. They are allowed to subsist mostly on whatever they can pick up in their territory, such as insects, bugs, worms, weed sprouts, and stray grains. Occasionally, however, whole corn or *tahup sa mais* (corn bran) or grated fresh coconut is given to the birds in the afternoon to supplement whatever they have picked up during the day. This induces them to come home after the day's search for food and also gives the owner a chance to recognize his birds.

The standard-breds are better fed than the native chickens. They are fed mash rations bought prepared or as individual ingredients which are mixed according to the user's feed formulas. Scratch grain in the form of palay or cracked corn is also given in addition to the mash feed. The ready-mixed feeds sold in feed stores are either imported or prepared by commercial mixers in Manila. Both kinds are much more expensive than home-mixed rations.

The following are sample feed formulas recommended to feed buyers by one of the feed dealers in Cebu City:

INGREDIENTS	RATION (PARTS BY WEIGHT)		
	Chick	Growing	Laying
Rice bran	40	40	40
Corn, yellow	20	20	20
Binlid	10	5	—
Copra meal	—	7	10
Fish meal	10	10	10
Soybean meal	10	10	15
Dried cheese whey	10	5	—
Alfalfa meal	—	3	5
	100	100	100

To every 100 kilograms of the rations were added the following:

Salt	1.5	0.5	0.5
Oyster shells	2	3	5
Cod liver oil	4 liters	3 liters	—

It will be noted that of the eleven ingredients used in the feed formulas only six are locally produced; the remaining five, namely fish meal, alfalfa meal, powdered oyster shells, and cod liver oil, are imported. These imported products are a continuous problem to the poultry raisers not only because of their high cost but also because of their unsteady supply in the local market. When one or two of these imported feedstuffs disappear from the market, the Cebu poultrymen simply incorporate in their rations whatever feedstuffs are available, so that the home-mixed rations change in composition every so often. As a result, egg production fluctuates continuously and the poultry raiser puts the blame on his birds.

The general feeding practice is the all-mash system in which mash feeds are kept accessible to the birds in open feeding troughs at all times during the day. When shelled corn is cheap, especially immediately after the harvest season, whole or cracked corn is given in addition to the mash. Wet mash is given to the birds during the summer months.

Diseases. In Cebu, as well as in other places in the Philippines, one of the greatest drawbacks to the poultry industry is the prevalence of numerous poultry diseases, among which are roup, coccidiosis, fowl cholera, avian pest, and fowl pox. Of these diseases, roup is considered the most widespread and destructive on month-old and mature birds alike. The warm and humid climate of the Philippines makes chickens succumb to this ailment easily. Next to roup, and occurring mostly on young chicks, is coccidiosis. Those who brood and rear chicks on wire and give occasional medication against this disease do not find coccidiosis as bad as roup. Avian pest and fowl cholera sometimes attack older birds especially in unvaccinated flocks. As a common practice, however, Cebu poultrymen vaccinate their birds against these diseases.

The work of the Bureau of Animal Industry veterinarians of the province is worth mentioning. At the time of the survey, three government veterinarians were giving part-time attention to the immunization and medication of commercial flocks. These veterinarians answered calls from poultry farms in or near the city.

Marketing. Since most of the moneyed class prefer white-shelled, big-sized eggs and table fowls that are raised in a sanitary way, commercial farms easily find regular customers for their products. The system of marketing poultry in Cebu described by Fronda in 1931 [3] is still followed today. In almost every town poultry and eggs are delivered to wholesalers or their agents who in turn transport these products to Cebu City markets for retail to consumers or for export to Manila. The towns of Bogo in the north and Mantaloñgon, Dalaguete, in the south are outstanding centers of poultry exchange. Poultry and eggs in the Bogo markets come from the nearby towns of Bantayan, Madridejos, Santa Fe, Medellin, Daanbantayan, and Bogo itself. Poultry and eggs in the Mantaloñgon markets come from the adjacent mountain barrios. No specific classification of poultry and eggs is followed. The chickens are arbitrarily classified on the basis of their weights as determined by handling. Eggs are not classified. Under this system one exporter alone, of the three in the city, can export an average of 100,000 native chicken eggs to Manila every week during the summer months. From 300 to 500 table fowls are shipped from the port of Cebu to Manila every week.

Prices. The prices of poultry feeds, poultry, and eggs vary during the different seasons of the year depending upon the prevailing supply and demand. At the time of the study, a bag of 45 kilo-

[3] *Ibid.*

grams of locally mixed commercial feed, whether starting, growing, or laying, sold at ₱18.00 to ₱19.00 and retailed at ₱0.50 a kilogram. On the other hand, a kilogram each of the feed ingredients retailed as follows: rice bran, ₱0.20; yellow corn, ₱0.22; white corn, ₱0.19; binlid, ₱0.30; copra meal, ₱0.20; fish meal, ₱0.85; soybean meal, ₱0.60; dried cheese whey, ₱1.50; powdered shell, ₱0.30; alfalfa meal, ₱0.30; salt, ₱0.10. Cod liver oil was ₱10.00 a gallon. At these prices, a kilogram of laying ration using the previously stated feed dealer's formula cost approximately ₱0.35, as compared to the ₱0.50 retail price of ready-mixed feeds. Many of the flock owners, therefore, find it more economical to mix their own poultry rations.

The average prices of poultry and poultry products are as follows:

Native:

Table eggs	₱0.08 each
Table fowls	₱0.80 to 2.50 each, depending on the size

Standard-bred:

Table eggs	₱0.14 each
Hatching eggs	₱0.30 each
Table fowls, broiler size	₱2.00 each
Day-old chicks	₱0.60 each
Ready-to-lay pullets	₱8.00 each

These figures give an idea of the stiff competition that the products from commercial flocks of standard-breds encounter in an open, indiscriminating market.

Outlook of the industry. Outstanding of the problems of the poultry industry of Cebu is the prevalence of poultry diseases. Breeding for more resistant stock, proper feeding and management, vaccination, and sanitary measures would help to minimize losses from diseases. Knowledge of the right feeds and system of feeding, correct management procedures, and basic principles of breeding for resistant birds is of paramount importance to anyone who expects to succeed in commercial poultry raising.

The existing unfavorable prices of feedstuffs and poultry products constitute another problem which needs the combined effort of all the poultry producers and the government. For the commercial poultry enterprises to survive in the competitive market, poultry associations and government agencies should work together to stabilize prices and the supply of imported as well as locally produced feedstuffs. This will enable capitalized poultry enterprises to produce poultry and poultry products that can be sold at prices within the buying capacity of the masses and at the same time compete with scavenger-raised chickens and their eggs. Unless remedial measures are taken, the organized poultry flocks of Cebu and other places in this country face an uncertain future.

RETAILING OF FARM PRODUCTS IN THE PUBLIC MARKET OF SAN PABLO CITY [1]

DOMICIANO E. RAYMUNDO

The products handled by the retailers surveyed in the public market of San Pablo City in 1952 were 27 kinds of fresh fruits; 43 kinds of vegetables; pork, beef, carabao meat, sausages; chicken and duck eggs; coffee and cacao products; rice and corn; dried beans; and root crops. Of the fruits, Carabao mango gave the highest yearly returns; of the vegetables, cabbage; of the meat and meat products, pork; of the beverages, ground coffee; of the dried beans, cowpea; and of the root crops, sweet potato. The bulk of the farm products came from different towns in the provinces of Laguna, Rizal, Quezon, and Batangas and from the suburbs of the city itself. The prices of the products, especially of the seasonal and more perishable kinds, fluctuated more than those of the storable ones. Lack of proper storage facilities and competition with occasional sellers were the most important problems encountered by the retailers surveyed.

The public market of San Pablo City may be rated as one of the largest marketing centers in Laguna. Sellers and buyers coming from Laguna, Quezon, and Batangas meet in this market every day of the week, particularly on Saturday and Sunday, the market days.

To understand certain aspects of retailing in the public market of San Pablo City, especially with regard to farm commodities, and to study the important problems connected with the retailing, this survey was conducted from January to December, 1952. Seventy retailers who occupied permanent stalls were interviewed weekly for a period of one year. Of these 70 retailers, 25 handled fruits and vegetables; 15, root crops; 10, meat and meat products; 5, cereals; 5, eggs; 5, coffee and cacao products; and 5, dried beans. Other pertinent information was gathered from market officials, consumers, and transportation agencies.

DISCUSSION OF RESULTS

Kinds of commodities handled and average receipts from sales. The 70 retailers had a good coverage of farm products handled in the public market of San Pablo City. These products were grouped into fresh fruits, fresh vegetables, meat and meat products, cereals, eggs, dried beans, and root crops.

Of the 27 fruits handled, papaya, calamondin, 4 varieties of bananas, and guava were available throughout the year; the rest were available for two to seven months (table 1). Including the 7 kinds of fruits available all the year round, 10 kinds were carried in stock

[1] Central Experiment Station Contribution No. 1698. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Agricultural Economics under the direction of Assistant Professor Nathaniel B. Tablante.

in January and December, 11 in March and November, 12 in February and April, 13 in October, 15 in May, 16 in June, 18 in July and September, and 19 in August. A monthly average of 14 kinds was carried in stock. It may be noted that more fruits were available in the half-year period from May to October than in the other half-year period.

On the basis of average total receipts from the sale of each kind of fruit during the year, the 10 kinds which gave the highest returns were Carabao mango, lanzones, Pico mango, papaya, mandarin orange, pummelo, calamondin, avocado, caimito, and pineapple. The sum of the average total receipts from these 10 kinds accounted for about seventy-eight per cent of the total amount derived from the sales of all the 27 kinds of fruits (table 1).

Of the 43 kinds of vegetables handled by the 25 retailers, 21, mostly the leafy kinds, were available throughout the year. These were ampalaya tops and fruits, banana "heart", cabbage, sweet potato tops, chayote, chive, garlic bulbs, kangkong, kinchay, lettuce, onions (bulbs and young plants), pakô or edible fern, pepper fruits and tops, pe-tsai, squash fruits, and upo (table 2). For each month, the number of available kinds ranged from 24 in June to 38 in December, or an average of 31 kinds. Thirty-seven kinds were handled in January, 34 in February, 32 in March, 29 in April, 27 in July, 31 in August, 31 in September, 31 in October, 33 in November, and 38 in December. Many kinds of vegetables were available in the first and last quarters of the year.

The 10 vegetables which gave the highest average total receipts were cabbage, Bermuda onion, watermelon, cauliflower, petsai, melon, cucumber, kondol, kinchay, and green corn (table 2). The sum of the average total receipts from these 10 kinds was more than two-thirds of the total amount received from the sales of 43 kinds of vegetables during the year.

Proper storage with refrigeration facilities was considered necessary to reduce losses resulting from spoilage particularly of the vegetables and fruits. The stock of perishable products was changed twice a week.

The average total receipts from the sales of the other products and their availability during the year are shown in table 3. Each of the 10 retailers of meat sold pork, beef, carabao meat, and sausages made from pork. Coffee was sold ground or as roasted whole beans. Fresh chicken eggs, fresh duck eggs, salted duck eggs, balut,[2] and penoy [3] were handled by the five egg retailers surveyed. Of the dried beans, cowpea and mongo gave the highest returns, and of the root crops, sweet potato and gabi.

Sources of products handled. The retailers interviewed reported that they drew their supply of farm products from the

[2] Boiled duck eggs which have been incubated for 18 days.
[3] Boiled infertile duck eggs.

suburbs of San Pablo City, from neighboring towns in the provinces of Laguna, Quezon, and Batangas, and from Manila. Mangoes, melon, and watermelon came originally from Alabang, Muntinlupa, Rizal; lanzones, from Paete and Santa Maria, Laguna, and from the suburbs of San Pablo City; bananas, atis, avocado, pineapple, jakfruit, chico, and citrus fruits, from Alaminos and Calauan, Laguna, and from Santo Tomas, Tanauan, and Malvar, Batangas. The town of Tiaong, Quezon, was an important source of some of the seasonal fruits. Most of the vegetables were drawn from Tanauan, Santo Tomas, and Malvar, Batangas. Singkamas came from Nagcarlan and Calamba, Laguna, and cabbage, pe-tsai, kinchay, and chive came from Manila.

Cattle and carabaos were purchased from Batangas, Batangas, and Santa Cruz, Marinduque. Hogs came from several towns of Laguna, Quezon, and Batangas provinces. Fresh duck eggs came from the towns of Los Baños and Victoria, Laguna. Calamba, Laguna, supplied the city market with balut and penoy. Salted duck eggs came from the city; fresh native eggs, from Santo Tomas, Batangas; and eggs of foreign breeds of chickens, from Manila.

The suburbs of San Pablo and the towns of Tanauan and Santo Tomas, Batangas, were the sources of dried beans. Sweet potato, gabi, and cassava came from Tiaong, Quezon, and from Alaminos, Laguna. Ubi, ginger, and tugui came from Santo Tomas, Batangas, and from the suburbs of San Pablo City.

The different products were transported from their respective sources by jeepneys, trucks, and passenger buses. Sellers coming from nearby places used pack animals, bull carts, and pushcarts.

Variations in prices. The coefficient of average seasonal fluctuation was used to measure the monthly variations in prices. It was obtained as a percentage by dividing the difference between the highest and lowest prices by the average of these two prices.

The 10 fruits with high coefficients of average seasonal fluctuation were calamondin, caimito, santol, camanchile, guava, Pico mango, cashew, guayabano, avocado, and Bungulan banana (table 1). The other fruits which fluctuated highly in price were seasonal in nature. Although calamondin, banana, and guava were available throughout the year, they had high coefficients of seasonal fluctuation because they were scarce at times during the year.

For vegetables, the 10 kinds with the highest coefficients of average seasonal fluctuation were tomato, radish, lettuce, native pepper, sweet potato, mustard, multiplier onion, eggplant, calamias, and calamondin (table 2). Of these 10 kinds, lettuce, native pepper, and multiplier onion were in the market all the year round; the rest were available at certain seasons. Many of the vegetables which had high coefficients of seasonal fluctuation were the seasonal and the more

perishable ones. Shepherd [4] stated that the prices of perishable products can be expected to fluctuate more than the prices of the more durable or storable crops. Norton and Scranton [5] remarked that most fruits and vegetables sell locally on the basis of local supply and demand: if there is a surplus, the price of the commodity is low, and if there is a scarcity, it is high. Thus, the prices of farm products are influenced by the seasonal nature of production.

The retailers of vegetables who occupied permanent stalls reported that they were often forced to compete with occasional vendors who could sell their products at lower prices. These sellers were generally farmers who did not have permanent stalls and did not pay space rentals.

There was little variation in the prices of meat and eggs (table 3). The price of eggs fluctuated slightly more than the price of meat. The coefficients of average seasonal fluctuation of the prices of rice and corn, dried beans, except cowpea and habichuelas, and coffee and cacao products did not exceed 50 per cent, indicating that the average monthly prices of these commodities did not change much. The prices of all root crops, except those of tugui and ginger, did not vary much, the average coefficients being more or less 50 per cent.

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[4] Geoffrey S. Shepherd, "Agricultural Price Analysis," Iowa State College Press, Ames, Iowa, 1941, 402 pp.

[5] L. J. Norton and L. L. Scranton, "Marketing of Farm Products," The Interstate Printers and Publishers, Danville, Illinois, 1937, 448 pp.

TABLE 1

Availability, average prices, and average total receipts of different kinds of fruits sold by 25 retailers in the public market of San Pablo City, 1952

COMMODITY	NUMBER OF MONTHS AVAILABLE	UNIT OF SALE	AVERAGE PRICE	COEFFICIENT OF AVERAGE SEASONAL FLUCTUATION	AVERAGE TOTAL RECEIPTS
			centavos	*per cent*	*pesos*
Mango, Carabao	3	each	30.5	33.8	1,009.35
Lanzones	4	kilo	105.7	60.0	996.45
Mango, Pico	4	each	10.6	68.4	295.45
Papaya	12	each	35.6	51.6	250.10
Mandarin orange	7	each	9.4	56.4	246.30
Pummelo	5	each	16.6	20.5	246.15
Calamondin	12	each	1.2	116.6	193.14
Avocado	5	kilo	25.1	62.4	175.08
Caimito	4	each	15.8	91.5	166.79
Pineapple	4	each	30.5	33.0	156.40
Banana, Lacatan	12	each	3.4	26.1	146.40
Jakfruit	5	each	237.2	23.1	114.78
Banana, Bungulan	12	each	3.6	61.4	113.60
Santol	4	each	0.5	90.9	107.40
Banana, Saba	12	each	2.0	43.9	102.10
Tiesa	5	each	17.7	36.8	86.85
Siniguelas	4	each	0.38	50.0	66.00
Chico	3	each	4.2	25.0	65.13
Banana, Latundan	12	each	1.4	53.3	63.75
Mango, Supsupin	4	each	2.9	26.1	47.25
Guayabano	5	each	27.0	62.9	38.76
Guava	12	each	1.5	70.9	32.54
Mabolo	2	each	9.0	33.3	22.70
Atis	4	each	7.5	28.5	22.41
Duhat	3	liter	5.6	37.3	17.73
Cashew	4	each	3.5	63.0	11.70
Camanchile	2	each	0.85	80.2	1.83
Total					4,796.14

TABLE 2

Availability, average prices, and average total receipts of different kinds of vegetables sold by 25 retailers in the public market of San Pablo City, 1952

COMMODITY	NUMBER OF MONTHS AVAILABLE	UNIT OF SALE	AVERAGE PRICE	COEFFICIENT OF AVERAGE SEASONAL FLUCTUATION	AVERAGE TOTAL RECEIPTS
			centavos	*per cent*	*pesos*
Cabbage	12	kilo	51.8	10.8	2,371.95
Onion, Bermuda	12	kilo	54.3	35.9	1,652.49
Watermelon	4	each	69.9	81.9	1,549.61
Cauliflower	7	kilo	272.9	48.1	993.60
Pe-tsai	12	kilo	53.4	50.8	989.80
Melon	4	each	31.7	86.3	662.78
Cucumber	9	each	15.6	71.3	629.30
Kondol	6	each	129.8	29.5	542.90
Kinchay	12	kilo	73.4	78.9	434.55
Corn, green	6	each	2.7	54.5	408.65
Onion, multiplier	12	bundle	7.6	94.1	392.78
Garlic bulbs	12	kilo	68.5	54.2	391.71
Banana flower	12	each	6.6	44.1	378.30
Onion, young	12	kilo	64.2	13.3	370.02
Sitao	8	bundle	7.9	66.2	341.63
Pepper tops	12	bundle	3.3	63.0	308.20
Upo	12	each	40.8	59.5	268.80
Chive	12	kilo	35.8	51.4	197.96
Eggplant	3	each	2.5	91.7	197.10
Lettuce	12	kilo	41.0	101.0	190.80
Singkamas	5	bundle	25.1	33.5	181.68
Squash fruit	12	each	48.9	29.0	177.90
Chayote	12	each	3.6	63.0	144.23
Ampalaya fruit	12	each	1.9	75.0	122.81
Mustard	4	bundle	4.0	95.2	113.75
Patola	6	each	21.1	58.6	110.85
Cowpea, green	7	bundle	7.4	74.6	110.40
Radish	6	each	2.8	101.6	84.65
Chicharo	4	ganta	23.8	28.2	75.44
Calamias	4	each	0.6	90.9	55.30
Pepper, sweet	12	each	1.4	96.8	53.10
Garlic, young	5	bundle	4.3	52.4	52.14
Tamarind, green and ripe	4	basket	370.0	16.5	48.64
Squash tops	7	bundle	5.1	36.4	48.18
Tomato	6	each	1.2	123.1	43.52
Sweet potato tops	12	bundle	2.6	71.7	43.07
Patani	4	each	0.4	50.0	34.93
Kangkong	12	bundle	2.2	60.5	34.53
Batao	4	each	0.5	66.6	32.92
Calamismis	8	each	0.8	88.8	27.54
Ampalaya tops	12	bundle	1.3	57.1	16.89
Pepper, native	12	each	0.6	100.0	15.93
Pako or edible fern	12	bundle	1.7	62.9	11.92
Total					14,913.25

TABLE 3

Availability, average prices, and average total receipts of meat, beverages, eggs, dried beans, and root crops in the public market of San Pablo City, 1952

COMMODITY	NUMBER OF MONTHS AVAILABLE	UNIT OF SALE	AVERAGE PRICE	COEFFICIENT OF AVERAGE SEASONAL FLUCTUATION	AVERAGE TOTAL RECEIPTS
			centavos	*per cent*	*pesos*
Meat and meat products:					
Pork	12	kilo	235.1	6.8	10,495.00
Beef	12	kilo	189.0	10.5	9,976.00
Carabao	12	kilo	133.0	10.1	7,275.00
Sausage	12	each	6.9	18.4	170.90
Total					27,916.90
Beverages:					
Coffee, roasted ground	12	ganta	594.9	10.7	3,765.25
Coffee, roasted whole	12	ganta	347.6	29.9	1,634.50
Cacao, chocolate cake	12	each	12.5	22.4	247.97
Total					5,647.72
Cereals:					
Rice	12	ganta	118.04	13.2	2,501.55
Corn	12	ganta	49.7	42.3	701.90
Total					3,203.45
Eggs:					
Duck, fresh	12	each	16.0	34.9	998.40
Balut	12	each	21.8	43.7	967.25
Penoy	12	each	17.7	56.8	452.30
Salted	12	each	19.6	39.4	344.25
Chicken, fresh	12	dozen	114.7	14.5	269.75
Total					3,031.95
Dried beans:					
Cowpea	12	ganta	173.5	62.4	1,105.45
Mongo	12	ganta	153.8	27.9	801.95
Habichuelas	12	ganta	42.4	51.8	308.00
Soybean	12	ganta	97.4	13.5	267.55
Tapilan	12	ganta	73.9	15.1	106.60
Total					2,589.55
Root crops:					
Sweet potato	12	kilo	19.5	51.8	694.98
Gabi, tagalog	6	kilo	24.3	31.6	429.20
Gabi, sungsong	7	kilo	23.2	54.9	361.53
Ubi	4	kilo	23.6	47.9	182.73
Cassava	6	kilo	23.9	42.7	115.08
Ginger	12	kilo	20.0	109.5	60.36
Tugui	5	each	2.8	106.6	34.81
Total					1,878.69

IODIZED CASEIN IN A RATION FOR LAYING HENS [1]

F. M. Fronda and Diomedes G. Flores

Iodized casein fed to Los Baños Cantonese and S. C. White Leghorn layers did not significantly increase egg production, but it caused a reduction in the amount of feed needed to produce a dozen eggs. It significantly increased the size and hatchability of the eggs produced, but did not influence the amount of feed consumed, the weight of the birds, and their mortality.

Protamone [2] is a synthetic product composed of casein and iodine with properties said to be similar to the natural hormone secreted by the thyroid. Studies made by Turner, Irwin, and Reineke (1945), Turner, Kempster, Hall, and Reineke (1945), Turner, Kempster, and Hall (1946), and Turner (1948) indicated that iodized casein, when incorporated at the rate of 10 grams to every 100 lbs. (45.4 kg.) in rations for laying hens, had a marked stimulatory effect upon the production of eggs. The results of more recent studies, however, showed that the feeding of iodized casein to laying hens not only failed to produce any favorable effect on the rate of egg production, but sometimes even failed to prevent a decline in egg production (Hutt and Gowe, 1948; Hoffman and Wheeler, 1948; Wilson, 1949; Godfrey, 1949; and Berg and Bearse, 1951). In order to help clarify these apparently contradictory reports, this study was conducted in the Department of Animal Husbandry from May, 1948, to July, 1949.

MATERIALS AND METHODS

Fifty Los Baños Cantonese and 60 Single Comb White Leghorn layers were used in this study. Based on their past production records, the birds of each breed were evenly divided into two lots. Both lots of each breed were placed in adjoining laying houses. Each of the four pens had a grassy run wide enough to supply the birds adequately with green feeds. Lot 1, the control, and lot 2, the experimental lot, were given the College all-mash laying ration. To the experimental lot, in addition, was given 10 grams of Protamone for every 45.4 kilograms of the ration. This amount of Protamone in the laying ration was recommended by the manufacturers. During the entire experiment, the feed was given dry in feeding troughs kept accessible to the birds at all times.

Records were kept of egg production, egg weight, and percentages of fertility and hatchability of eggs in the four lots. The ini-

[1] Central Experiment Station Contribution No. 1699. Based on a thesis presented by the junior author for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture, April, 1950. Prepared in the Department of Animal Husbandry under the direction of the senior author.

[2] Protamone is a commercial product of the Cerophyl Laboratories, Inc., Kansas City, Mo., U.S.A. The authors are grateful to the manufacturers for generously supplying the material used in this study.

tial and monthly weights of the birds, the amount of feed consumed, and the rate of mortality in all lots were also recorded.

RESULTS AND DISCUSSION

Production of eggs. Egg production of both breeds was slightly higher in the experimental lots than in the control lots (table 1). Among the Los Baños Cantonese there was a difference of only 3.3 eggs a bird in favor of the experimental lot. Among the S. C. White Leghorns, the difference was 17.5 eggs to each hen in favor of the experimental lot. What may be considered of interest is the fact that in both breeds, the amount of feed needed to produce a dozen eggs was much less in the experimental lots than in the controls (table 1).

Although both breeds did not show significant increases in egg production after they were fed Protamone, their rate of laying did not decline as observed by several of the previous investigators (Wilson, 1949; Godfrey, 1949; and Berg and Bearse, 1951). A similar study conducted under more favorable conditions than those obtaining during the present investigation might produce more conclusive results.

The investigators (Turner, Irwin, and Reineke, 1945; Turner, Kempster, Hall, and Reineke, 1945; Turner, Kempster, and Hall, 1946; and Turner, 1948) who reported that iodized casein had a marked stimulatory effect upon egg production declared that in cold weather, the thyroid gland produces the thyroid hormone at a more rapid rate than in warm weather. When Protamone was fed to the hens in warm weather the thyroid hormone deficiency was replaced, resulting in the maintenance of egg production at a fairly high level. This effect was reported chiefly during late spring and early summer when production normally declines.

Weight of eggs. The average weights of eggs laid by the control and the experimental birds in both groups (table 1) showed differences which were significantly in favor of eggs from birds that had iodized casein in their ration. These results are contrary to the findings of Hutt and Gowe (1948) that Protamone had no measurable effect upon egg weight in March. Berg and Bearse (1951) also observed that the feeding of iodinated casein to hens had no effect on the weight of the eggs produced. Gutteridge and Pratt (1946) and Gutteridge and Novikoff (1947) reported an increase in the weight of the eggs produced by Protamone-fed hens and attributed this advantage to the increase in shell weight.

Hatchability of eggs. Three hatches were made in each lot in February, March, and April. The incubation results show that there was practically no difference in the fertility of the eggs produced by the birds in both lots (table 1). In lot 2 of both breeds, however, the percentages of dead germs (D1, D2, and D3) were constantly lower than those in lot 1. It was further observed that the hatchability of eggs produced by the birds in the experimental lots of both breeds was much higher than that of the controls. The results are

apparently contrary to the findings of Hutt and Gowe (1948) that iodized casein given at a level which Turner and his associates considered optimum had no measurable effect upon viability. Gutteridge and Novikoff (1947) reported that the addition of thyroprotein to a laying ration did not deleteriously affect the hatchability of the eggs.

Consumption of feed. In both breeds, the amount of feed consumed was practically the same in the control and in the experimental lot (table 2). Fronda (1933) reported that Los Baños Cantonese layers had an average feed consumption of 30.04 kilograms a year, and Campos (1950) reported that S. C. White Leghorn layers on a ground run consumed 31.1 kilograms of feed a year. The results show that the addition of Protamone to the ration did not influence the amount of feed consumed.

Weight of birds. The Los Baños Cantonese birds increased in body weight; the S. C. White Leghorn birds also increased slightly in body weight (table 2). The differences in weight between lots 1 and 2 in both breeds were insignificant. Hutt and Gowe (1948) and Godfrey (1949) reported that iodinated casein produced no effect on body weight, but Turner (1948) and Berg and Bearse (1951) observed that the feeding of thyroprotein reduced the average body weight. On the other hand, Turner, Kempster, and Hall (1946) reported that Protamone feeding slightly influenced seasonal changes in the body weights of S. C. White Leghorn hens. Among Rhode Island Red hens, however, the controls were heavier than those fed thyroprotein.

Mortality. Four hens in lot I of the Los Baños Cantonese breed and five hens in lot 2 of the same breed died during the year (table 2). During the early part of the experiment, two birds in lot 1 died in an accident and during the last part, two died of an undetermined disease. In the second month of the study, two birds in lot 2 died of apparently the same disease. During the middle part, two birds became thin and later died of what was suspected to be fowl tuberculosis. One bird died of ruptured egg yolk on October 31, 1948, a day after a weighing was made.

Lot 1 of the S. C. White Leghorns lost 15 birds during the year. Of these birds, however, six were killed by a boa during the early part of the experiment. Three birds died of edema and infection of the comb and wattles, four died of undetermined cause, and two apparently died of tuberculosis. Thus, of the 15 birds that were lost from this lot, only nine may be considered to have died of disease. Of the nine birds which died in lot 2, four gradually lost weight and eventually died of a disease suspected to be tuberculosis, two died of roup, and three of an undetermined cause. Blaxter *et al.* (1949), in a report to the Committee of the Animal Society of Animal Production, stated that iodized casein and synthetic goitrogens had no demonstrable effect on mortality with the small number of hens used.

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TABLE 1

Influence of iodized casein on egg production

ITEM	LOS BAÑOS CANTONESE		S. C. WHITE LEGHORN	
	Lot 1	Lot 2	Lot 1	Lot 2
Average annual egg production:				
Percentage	18.6	19.5	27.6	32.4
Number	67.9	71.2	100.9	118.4
Amount of feed needed to produce a dozen eggs, kilograms	5.5	5.1	4.0	3.0
Cost of feed needed to produce a dozen eggs, pesos [a]	1.38	1.28	0.88	0.66
Average weight of eggs, grams	39.5∓0.096	41.0∓0.11	49.6∓0.22	52.2∓0.52
Percentage of infertility [b]	39.3	36.5	30.5	29.4
Percentage of hatchability [c]	49.6	71.4	56.0	78.1

[a] Average cost of a kilogram of feed: Los Baños Cantonese, ₱0.25; S. C. White Leghorn, ₱0.22.

[b] Apparent infertility.

[c] Based on fertile eggs.

TABLE 2

Influence of iodized casein on feed consumption and health of the birds

ITEM	LOS BAÑOS CANTONESE		S. C. WHITE LEGHORN	
	Lot 1	Lot 2	Lot 1	Lot 2
Number of birds at the start	25	25	30	30
Average weight of the birds at the start, kilograms	1.48	1.32	1.46	1.47
Average feed consumption a year, kilograms	31.1	30.5	32.2	31.8
Average weight of the birds at the end, kilograms	1.53	1.46	1.63	1.67
Percentage of increase in weight	3.38	10.61	11.64	13.60
Number of birds that died	4	5	15 [a]	9
Percentage of mortality	16.0	20.0	50.0	30.0

[a] Six of these birds were killed by a boa.

THE BREEDING HABITS OF BERKJALA SWINE[1]

CASIMERO D. BASCOS

The most common signs of oestrus noted were restlessness, loss of appetite, mounting of other hogs regardless of sex, congestion of the vulva, frequent attempts to urinate with little or no discharge, and distinctive grunts emitted constantly as if calling for the mate. The average length of the oestrual period was 76.80 hours. Oestrus occurred for the first time in pigs at the average age of 4 months and 25 days. It recurred 2 to 4 days after farrowing.

The average interval between weaning and reappearance of oestrus was 7.14 days. In unbred sows the average interval between oestruses was 20.13 days.

The average number of services that the sow allowed the boar in one heat period was 6.6. Mating lasted an average of 3.59 minutes. The average interval between consecutive matings was 11.70 hours for five sows.

On the average, gestation lasted for 113.66 days, and parturition, for 5.97 hours. The average interval of expulsion of the fetuses in six sows ranged from 8.16 minutes to 19.14 minutes; the general average was 13.44 minutes. Between the expulsion of the last fetus and that of the placenta was an average of 3.70 hours. The average loss in weight of the farrowing sows was 12.43 kg. The average weight of the litter at birth was 8.53 kg., and the average weight of the placenta and fluid was 3.90 kg. The total sum of 12.43 kg. was the average loss in weight of the sows incident to farrowing.

A knowledge of the breeding habits of Berkjala sows and boars will contribute to the efficiency and economy of swine production. This study was conducted from June, 1950, to June, 1951, to observe the following: (a) signs, phases, duration, first appearance, and recurrence of oestrus; (b) behavior of the sow and boar during mating and frequency, interval, and duration of mating; (c) changes in weight and body measurement of the sow during gestation and duration of gestation; (d) signs of approaching farrowing; and (e) behavior of the sow during parturition and duration of farrowing.

Hadley (1942) noted oestrus in sows as young as three months, and Rice (1942) observed the onset of sexual activity in sows about three to six months old. In the males, Mondoñedo (1934) found that sexual maturity is reached as early as 16 weeks of age.

Southwell, Wheeler, and Duncan (1940) reported that sows usually come in heat the third day after delivery and sometimes before the pigs are weaned.

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[1] Central Experiment Station Contribution No. 1700. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Animal Husbandry under the direction of Associate Professor Mariano Mondoñedo.

The duration of oestrus, according to Hadley (1942), ranges from one to three days. In Rice's (1942) observations, oestrus ranges from one to five days, or an average of two to three days. Hughes and Heitman [2] found that the heat period of sows lasts about three days.

Southwell, Wheeler, and Duncan (1940) reported that sows, on the average, come in heat every 18 to 24 days. According to Rice (1942), heat recurs at intervals of 18 to 24 days, with 21 days as the average.

Rice (1942) mentioned the signs of pregnancy as cessation of the normal recurrence of heat periods, increase in size and weight, movement of the fetuses, and tendency of the sow to become quiet and to lay on flesh.

The signs of approaching parturition were numerated by Rice (1942) as marked and sudden change from quietness to general nervousness, fickle appetite, plaintive grunts indicating pain, and perceptible movement of the fetuses through the body wall. At this time, if the sow is not restrained, she seeks seclusion from her kind and starts to gather materials for bedding. The gravid uterus becomes heavy and, as a result, the back sags. Also, the enlarged abdomen drops and the udder becomes hard and tender.

At parturition, Rice (1942) observed that labor pains set in from one to a few hours before the expulsion of the first fetus. The sow lies down quietly and shows signs of pain, like getting up and pacing restlessly. At first the pain is of short duration, lasting from a few seconds to one or two minutes. It subsides and the sow remains quiet again for about 15 minutes. The labor pain returns several times; its duration lengthens and the intervals of subsidence shorten. Parturition, from the expulsion of the first fetus to the last one, lasts from one-half hour to five hours, and the interval between pigs is from 10 to 30 minutes or an hour.

MATERIALS AND METHODS

Materials. Six weanling pigs, nineteen yearling sows, ten two-year-old sows, four mature sows, and four boars were used in this study.

Each sow and her litter were kept in a hog pen with an adjoining outdoor run. The hog pens were 2 meters wide and 2.5 meters long, with concrete floors and board walls. The hog runs were 7 meters long and 2.5 meters wide. Rice straw was provided as bedding for nursing sows.

Between feeding hours, the pregnant sows had access to pastures 75 meters long and 25 meters wide. The pastures were covered with mixed grasses except during the dry season.

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[2] E. H. Hughes and Hubert Heitman, Jr., *California Agric. Ext. Serv. Cir* 15 (1949).

The rations used, all parts by weight, were as follows:[3]

CONSTITUENTS	No. 1	No. 2	No. 3	No. 4
Corn	10	15	20	25
Rice bran	60	60	60	60
Copra meal	20	18	16	13
Fish meal	10	7	4	2
Total	100	100	100	100

Feeding and management. All the animals were on the concentrate-pasture system of management. Gilts and sows were given feed mixtures No. 3 and No. 4. They were hand-fed most of the time in the hog house and pastured out between feeding times. Farrowing and nursing sows were kept in separate pens.

Gilts in gestation were given feed mixture No. 2 in the first half of pregnancy and ration No. 1 in the second half. Two-year-old sows in their second gestation received ration No. 3 and then No. 2. The mature pregnant sows were given ration No. 4 and then No. 3.

During the nursing period, each sow with her litter was confined in the nursing pen. The sow was allowed in a designated hog run two or three times a day regularly for exercise, fresh air, and sunshine and for her necessities. The pigs had access to the hog run adjoining the nursing pen. In addition to ration No. 1, the sow and her pigs were given about one kilogram green soilage for every 100 kilograms live weight from the fourth week to the end of the nursing period.

The breeding boars were kept in separate pens to avoid their fighting with each other. They were kept on the concentrate-pasture system of management when not in active service. When in active service, they were closely confined and were given feed mixtures No. 1, 2, 3, or 4 depending upon their age, condition, and breeding activities. One boar was used as a teaser. During adverse weather, the animals were kept in the hog house. Drinking water was always made available to them.

Weighing. On a portable scale of 750-kilogram capacity, every sow was weighed weekly after mating, during gestation, and after farrowing. The pigs were also weighed.

Measurement. Each sow was measured with a metric tape measure from the first to the last week of the gestation period.

Observation of signs, duration, and intervals of oestrus. The animals were observed daily from 6:00 to 7:00 o'clock in the morning and from 4:00 to 6:00 in the afternoon. One to two days before a sow was expected to come in heat, she was confined with the boar in a small enclosure for close observation. From the first sign of heat, when the sow permitted the boar to mount, to the end of heat,

[3] M. MONDOÑEDO, *College of Agriculture Cir.* 32 (1949).

observation was made day and night. Oestrus was ended when the sow refused to receive the boar even after repeated attempts to mount her. To further check the presence of heat, another boar used as a teaser was brought to the sow. The two were put together for about thirty minutes and then separated after the boar had repeatedly attempted to serve the sow and had been rejected.

The number and duration of matings and intervals between matings were also observed. The duration of mating was taken as the time between the successful insertion of the copulatory organ and its withdrawal.

Females which manifested oestrus were assumed to have reached the age of puberty. The date of the first manifestation of oestrus and the herd number of the animal were recorded. These females, however, were not bred because they had not sufficiently attained the growth and development that would insure successful raising of progeny.

To determine the recurrence of oestrus after farrowing, the dam was brought to the boar daily for a week after the first day of farrowing. The sow that came in heat was bred by the boar. The date of oestrus and the herd number of the animal were recorded. Nine sows were used in this study of post-partum breeding.

The length of time between weaning and reappearance of oestrus in sows was observed and recorded. All the seven sows that came in heat were bred.

To determine the interval between two consecutive oestruses, a boar with a strong fabric strapped in front of its sheath to prevent mating was brought to the sow in oestrus. Mounting took place. The length of time between the acceptance of the boar in the previous oestrus and acceptance in the following oestrus was taken as the interval between consecutive oestruses.

Observation of signs of pregnancy and approaching parturition. The behavior of the sows during pregnancy and immediately before, during, and immediately after farrowing was carefully observed.

DISCUSSION OF RESULTS

Signs of oestrus. The following signs of oestrus were observed: (1) enlargement of the external genitals as evidenced by sensitivity to touch; (2) restless pacing and attempts to get to the confined boar or boars; (3) mounting of other animals in the same herd; (4) capricious appetite; (5) frequent attempts to urinate with little or no discharge, showing sexual perturbation; (6) distinctive grunts emitted constantly as if calling for the mate. These signs, according to Rice (1942) and Southwell, Wheeler, and Duncan (1940) lead to the period of sexual excitement in females. Some of the signs were more common than the others and were more marked in some of the sows.

Duration of oestrus. Oestrus ranged from 74 to 80 hours, or an average of 76.8 hours. The average duration of oestrus reported

by Hughes and Heitman (1949)[4] was 72 hours, 4.8 hours shorter than the result obtained in this study.

Occurrence of first oestrus in sows. Gilt No. 1142 came in heat when four months and two days old, the earliest to do so in this study. Gilt No. 927 came in heat when six months and six days old. The average age at which the six females came in heat was four months and 25 days. Craig (1946) stated that gilts may conceive when four months old. Mondoñedo (1936) found that a male Berkjala pig reaches the age of puberty, as evidenced by the presence of perfectly formed living sperms in the testes, at 16 weeks of age.

Recurrence of oestrus after farrowing. Nine sows came in heat two to four days after farrowing, the average being three days. Each sow was bred to a boar. None, however, was safely settled. Mondoñedo observed in his unpublished records that sows come in heat soon after farrowing if they lose their pigs by accident or by design. If bred, they may safely settle. Coburn in 1906, as cited by Warnick, Casida, and Grummer (1950), observed that sows will take the boar from the second to the fourth day after farrowing. Smith cited a statement of Robinson in issue No. 5, volume III, of the Ohio Experimental Station Bulletin that sows may be safely settled while still nursing their litters provided that they are separated from their litters at night during the nursing period. In this study, the sows and their litters were not separated.

Seven of the sows did not come in heat during the eight-week nursing period. Sow No. 74 came in heat 16 days after weaning, and sow No. 316, two days after weaning, the latest and the earliest, respectively. The average time for the seven sows to come in heat was 7.14 days after weaning.

Interval between consecutive oestruses. The interval between two consecutive oestruses in the individual sows studied ranged from 19 days, in sow No. 601 and No. 104, to 22 days in sow No. 31. The average interval for the 12 sows was 20.13 days.

Behavior of sow and boar. The sow refused to be mounted except at the maximum height of heat when she was quiet and passive and stood still. The copulatory act was then accomplished easily and quickly.

The sows, when in heat, approached the boar and allowed the boar to cover. Two sows smelled the reproductive organs of the boar and three sows grunted during mating.

All the boars manifested the following behavior: (1) approaching of the sow, (2) smelling of the external genitals of the sow, (3) pausing before protrusion, (4) protrusion of penis, (5) passing of droplets of watery discharge, and (6) mounting and mating.

When the height of heat had passed, the sow would no longer allow the boar to consummate the service. When oestrus had sub-

[4] HUGHES AND HEITMAN, *op. cit.*

sided, the sow and the boar paid no more attention to each other. Mating occurred more frequently early in the morning before feeding, late in the afternoon, after feeding, and at about noontime. Mating occurred rarely at night when both sow and boar were at rest.

Frequency of mating in one oestrus. Sow No. 74 was bred by boar No. 275 seven times, and sow No. 234 by boar No. 275 six times. The average number of matings for the five sows was 6.6 times.

Interval between matings. In sow No. 355 which accepted the boar seven times in one oestrual period, the average interval between matings was 10.58 hours, the shortest among the sows studied. In sow No. 193, the average interval between six services was 12.68 hours, the longest among the sows. The average interval for the five sows was 11.70 hours.

Duration of mating. The average duration of mating of sow No. 391 was 3.25 minutes, the shortest among the sows observed; that of sow No. 74 was 4.16 minutes, the longest. The average was 3.59 minutes.

Signs of pregnancy. The following were the signs of pregnancy observed: (1) cessation of the recurrence of oestrus; (2) change in disposition—the sows appeared to be more quiet, showed more appetite, and grazed more closely; (3) rapid gain in weight and rapid increase in measurement of middle girth; and (4) movement of the fetuses in the uterus.

The increase in weight ranged from 13.00 kg., or 10.03 per cent of the initial weight in sow No. 269, to 72.40 kg., or 51.20 per cent increase in sow No. 193. The greatest percentage of increase over the initial weight, however, was 68.89 per cent, made by sow No. 271. The average gain in weight of the 13 sows was 36.74 kg., or 34.02 per cent of the initial weight.

The average increase in the measurement of the middle girth made by 13 sows for the entire period of gestation was 32.02 cm., or 23.85 per cent of the measurement taken after the animals had been bred.

Gestation. The length of the gestation period ranged from 111 to 116 days. The average for the 15 sows studied was 113.66 days. The average gestation periods reported by Hughes and Heitman (1949)[5] and Rice (1942) are slightly longer than the result obtained in this study.

Signs of approaching parturition. The following signs of approaching farrowing were observed: (1) a more or less sudden development of the motherly instinct as manifested by the sow's desire to protect her young five to ten days before farrowing; (2) gathering of materials for bedding for the coming litter one to two days before farrowing; (3) marked enlargement of the mammary glands and of the external genitals one to two days before farrowing; (4) sudden

[5] *Ibid.*

dropping of the abdomen, hollowing of the flanks, and sinking of the rumps one to three days before farrowing.

Farrowing. Parturition began with the rupture of the fetal membrane. The interval between the rupture of the fetal membrane and the expulsion of the first fetus ranged from 0.20 hour, or 12 minutes, in sow No. 148 to 0.32 hour, or 19.20 minutes, in sow No. 271. The average for the sows observed was 0.242 hour, or 14.52 minutes. During this interval, the sow periodically extended its upper hind leg forward and kicked it backward. At each motion, fluid trickled out through the aperture; during the intervals, little or no fluid came out.

The average interval of expulsion of the fetuses ranged from 0.136 hour, or 8.16 minutes, in sow No. 148 to 0.319 hour, or 19.14 minutes, in sow No. 120. The general average for the six sows studied was 0.224 hour, or 13.44 minutes. The longest interval of expulsion of pigs reported by Rice (1942) was one hour. In this study the longest interval was one hour and 31 minutes in sow No. 120; the shortest was one minute in sow No. 137.

The time between the expulsion of the last fetus and the initial expulsion of the placenta ranged from 0.13 hour, or 7.8 minutes, in sow No. 271 to 1.40 hours, or 84 minutes, in sow No. 137. The time between the expulsion of the last fetus and the complete dropping of the placenta in sow No. 271 was 0.39 hour, or 23.4 minutes; that in sow No. 137 was 8.15 hours. The average for the six sows was 3.70 hours.

The length of time of farrowing ranged from 2.88 hours in sow No. 271 to 10.98 hours in sow No. 137. The average for all the sows was 5.97 hours, or 5 hours and 58 minutes.

The loss in weight of the sows incident to parturition ranged from 7.00 kg., or 4.85 per cent, in sow No. 269 to 16.50 kg., or 8.75 per cent, in sow No. 136. The average for the 12 sows was 12.43 kg., or 8.09 per cent of the weight before farrowing. The weight lost was the weight of the fetal menbrane, placenta, and amniotic fluid. The initial weight of each litter ranged from 5.50 to 11.40 kg., or an average of 8.53 kg.

At expulsion every pig was covered with a transparent membrane. The stronger ones were freed from this covering by their repeated struggles to get up during the rapid drying up of the membrane. After a few minutes, the young instinctively looked for the mammary glands.

All the sows, except sow No. 120, ate the placenta.

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YELLOW LEAF SPOT OF SUGAR CANE[1]

PABLO B. DIGNADICE AND FAUSTINO T. ORILLO

WITH TWO TEXT FIGURES

Yellow leaf spot is found in several sugarcane-growing countries in the Orient and in the Western Hemisphere. The disease is usually a minor one, but in a favorable environment it becomes serious and causes appreciable reduction in tonnage and sugar yield. A symptom of infection is the presence of yellow to reddish-brown, irregular spots with deep-red borders on both surfaces of the leaves.

The disease is caused by *Cercospora kopkei* Krüger. The fungus does not grow in pure culture on artificial media. It produces conidia which remain viable for only two to four weeks. The fungus can be disseminated by wind, insects, rain splashes, and other agents. It lives over from season to season in the form of dormant mycelium within the infected trash.

In the field and in the laboratory, POJ 2878, College 39, H37-1933, H32-8560, POJ 2961, POJ 2883, and POJ 3016 were highly infected by yellow spot; POJ 2714, M 1900, PSA 132, and PSA 76 were moderately infected; and F 108, F 109, and Alunan were slightly infected. Cross-inoculation experiments showed that talahib can be infected by the fungus.

The disease may be controlled by burning the trash after harvest, draining excess water in the field, completely destroying the weed host, and perhaps spraying the plants with fungicides such as "Spraycop" and "Fermate." To reduce to the minimum the losses due to the disease, only slightly susceptible varieties should be planted.

Yellow spot is a prevalent minor disease which attacks the leaves of sugar cane, *Saccharum officinarum* Linn. In favorable weather and among susceptible varieties, it becomes so serious as to alarm sugarcane planters. The disease is persistently present in all sugarcane regions of the Philippines, and yet very little or nothing has been done on it. This study was made from December, 1951, to February, 1953, in the Department of Plant Pathology and in the Central Experiment Station and its vicinity to uncover more facts about the disease and its cause which may be used in formulating effective measures of control.

THE DISEASE

History and geographical distribution. First mention of the disease in the Philippines was made by Copeland in 1916. Reinking[2] and Ocfemia (1939) listed yellow spot as one of the diseases occurring on sugar cane in the Philippines. Reyes (1950) reported the first serious outbreak of the disease in Negros. According to Martin (1951) the yellow leaf spot occurs in New Guinea, Australia, Argen-

[1] Central Experiment Station Contribution No. 1701. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture, April, 1953. Prepared in the Department of Plant Pathology under the direction of the junior author.

[2] O. A. Reinking, *Sugar Central News*, [14] 1, 22 (1929).

tina, Brazil, British Guiana, China, Colombia, Cuba, Formosa, India, Indochina, Java, Okinawa, Philippines, Reunion, Trinidad, Tobago, and Union of South Africa.

Economic importance. Yellow leaf spot is usually of minor importance though almost always present in the field, especially on POJ cane, throughout the cane season. The disease readily develops in epiphytotics during prolonged cool, showery days. At this time the field may appear pinkish to brown because of the coalesced spots on the leaves. The leaves of heavily infected plants dry up prematurely, resulting in stunted canes and a considerably decreased tonnage yield.

Fig. 1.—Portions of sugarcane leaves showing different stages of infection with yellow spot (× ¾). Left to right: final stage of the disease; early stage; and later stage. (*Photograph by Photographic Division, College of Agriculture*).

Reyes (1950) reported that yellow spot reduces the sugar yield from 1.83 piculs to 1.53 piculs per ton, a reduction of 16.3 per cent. Su (1938) observed that yellow spot was prevalent on the Co. 213 variety in Burma. Padwick (1939) also reported that the disease has considerably damaged sugarcane foliage, particularly of the thick varieties, in Jorhat, India.

Symptoms. Yellow leaf spot attacks sugar cane as early as one month after the canes are planted. The first symptom of infection is the presence of pale-yellow to bright-yellow spots on both surfaces of the leaves (fig. 1, middle leaf). The spots are irregular in outline and vary greatly in size, the majority attaining a diameter of about five millimeters. In the later stage of infection, red dots appear on the spots. On susceptible varieties the entire spot becomes reddish, with deeper red borders. When conditions are favorable to the development of the fungus, the under surface of the infected leaf becomes covered with a whitish to grayish growth consisting of conidiophores and conidia of the causal fungus. As the disease progresses, the numerous spots coalesce and form large, irregular, reddish patches which sometimes cover almost the entire leaf blade including the midrib. Observations in the field showed that the spots are more conspicuous and abundant on the older lower leaves (fig. 1, right leaf) than on the upper younger ones. This is due perhaps to the position of the older leaves and their proximity to the ground. On account of their more or less horizontal position and greater area, the older leaves are more apt to catch the moisture evaporating from the soil. The increased humidity of the atmosphere beneath these leaves greatly favors growth and sporulation of the pathogen. In the final stages of the disease the entire infected leaf turns reddish (fig. 1, left leaf) and dies prematurely.

CAUSAL ORGANISM

The tissue-plating and single-spore methods of isolation were employed. The culture media used were potato-dextrose agar, sugarcane decoction agar, nutrient agar, Czapek's agar, corn meal agar, and coconut water agar. All attempts to grow the fungus on the various agar media failed. Direct planting of infected leaf sections on agar, without previously disinfecting them in a 1:1000 solution of mercuric bichloride, also gave negative results. In the single-spore isolation, the spores germinated and produced normal germ tubes. After attaining a certain length, however, the germ tubes ceased to grow any further. From the results of this isolation work, the writers conclude that the fungus is not culturable or perhaps had not been supplied the proper ingredients for growth. Welles (1925) and Roldan and Querijero (1939) reported the same experience with some species of *Cercospora.*

Morphology: *Mycelium.* The mycelium of the yellow leaf spot fungus is found within the tissues of the host. The hyphae are septate, sparingly branched, sub-hyaline to light brown, and finely granular (fig. 2A). Measurements of 100 hyphal cells taken from decolorized and stained sections of diseased leaves show that the cells are from $10.56 - 22.88 \times 2.64 - 4.40\ \mu$. The average size is $15.82 \pm 0.05 \times 3.27 \pm 0.21\ \mu$ (table 1).

Conidiophores. The conidiophores are produced in abundance on the lower surface of the leaves. They are in fascicles of 3 to 10

which emerge from the stomatal openings. The conidiophores are simple, two- to five-septate, and are irregularly bent, with marked geniculations at the distal end (fig. 2B). They are light brown, but the apices are sub-hyaline. Two hundred conidiophores were measured and found to be from 38.72 — 65.12 × 3.52 — 7.04 μ. The average size is 50.67 ± 0.22 × 5.26 ± 0.03 μ. Table 2 shows that the length of conidiophores varies considerably, but the width varies only slightly. The greatest number of conidiophores falls within a length-to-width ratio ranging from 9.0 to 10.49 (table 3).

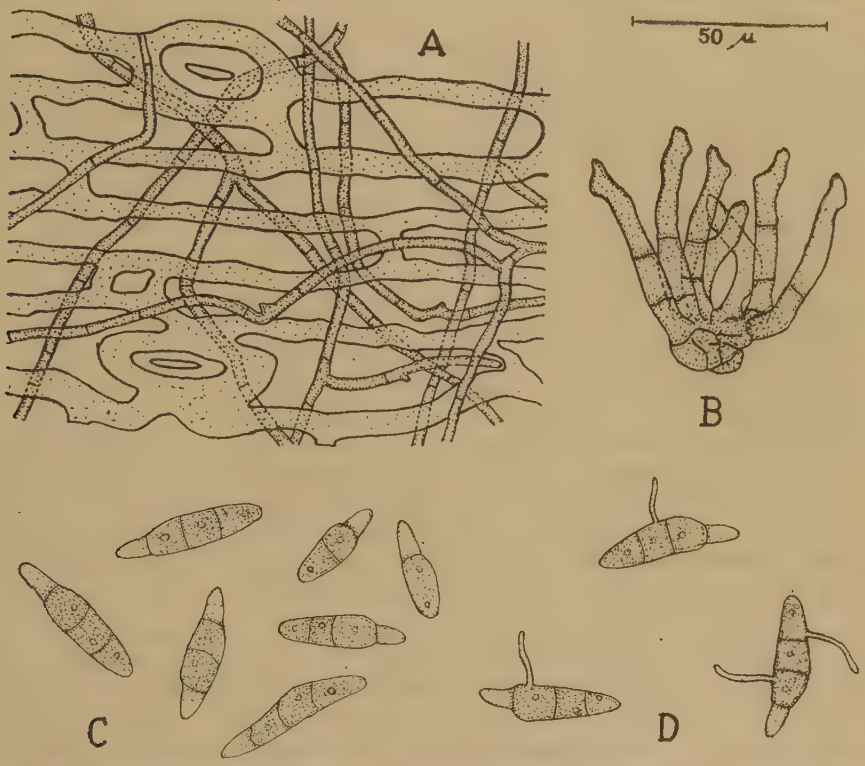

Fig. 2.—Camera lucida drawings of *Cercospora kopkei* Krüger. (A) Mycelium drawn from decolorized section of diseased sugarcane leaf stained with Pianeze IIIb; (B) group of conidiophores produced on host leaf; (C) conidia; (D) germinating conidia.

Conidia. The conidia are formed singly at the tip of the conidiophores. They are thin-walled, one- to three-septate, and fusoid in shape. When young they are almost hyaline, but with age they turn sub-hyaline to light brown with a greenish tint. The apical end is drawn out to a more or less tapering hyaline prolongation (fig. 2C) which is rarely septate. In most cases the conidia have their greatest thickness at the cell adjoining the base of the hyaline prolongation. Measurements of 200 conidia reveal that the length ranges from 22.88

to 45.76 μ and the width, from 5.28 to 7.04 μ. The average size is 35.75 $\pm$ 0.26 $\times$ 6.71 $\pm$ 0.05 μ. The conidia vary greatly in length but very slightly in width (table 4). Most of the conidia fall within the length class ranging from 32.0 to 39.9 μ and within the width class from 7.0 to 8.9 μ. The majority of the conidia have a length-to-width ratio ranging from 4.50 to 5.99 (table 5).

Physiology: Germination of conidia. Conidia taken from fresh diseased specimens were mounted in hanging drops of tap water and distilled water in van Tieghem cells and on thin layers of potato-dextrose agar, coconut water agar, and Czapek's agar on glass slides. The slide mounts were incubated inside a moist chamber. These preparations were observed every hour for the germination of spores.

At laboratory temperature (27 — 28°C.) the conidia germinated within 9 to 24 hours. The conidia mounted in tap and distilled water and on the three agar media did not show any marked difference in length of time required for germination. It was also observed that a greater number of conidia germinated on Czapek's agar. Practically the same number germinated in the other preparations. The conidia usually germinate by the production of one to two hyaline germ tubes from the darker colored cells (fig. 2D). No germ tube was observed to arise from the hyaline prolongation.

Viability of the spores. At the start of the work diseased sugarcane leaves which had an abundance of spores were kept (a) in pots of sterilized soil placed in the shade and protected from rains and (b) in closed dry receptacles. At the end of one month, spores were scraped off carefully from the diseased specimens and tested for their viability in distilled water in van Tieghem cells and on potato-dextrose agar on glass slides. The writers made several trials from the two batches of specimens but failed to observe any germination.

Fresh specimens with abundant spores were collected again and kept under the conditions mentioned above. This time viability tests were performed at weekly intervals. It was found that the spores taken from the specimens kept in the soil remained viable for three weeks at most. The spores in the dry receptacles were no longer viable after a little more than a week. The results of the viability tests reveal that the spores of *Cercospora kopkei* are short-lived.

Taxonomy. The fungus which causes yellow spot of sugar cane in the Philippines is similar in many features to *Cercospora kopkei* Krüger. Saccardo (1884) reported the following figures for this fungus: conidiophores, 40 — 50 $\times$ 7 μ ; conidia, 20 — 50 $\times$ 5 — 8μ, or an average size of 40 $\times$ 6 μ. The writers found that the conidiophores of the Philippine fungus are 38.7 — 65.1 $\times$ 3.5 — 7.0 μ and the conidia are 22.8 — 45.7 $\times$ 5.2 — 7.0 μ; the average size is 36.7 $\times$ 6.7 μ. The slight discrepancies between the measurements given by Saccardo and those reported in this paper are considered taxonomically insignificant since the sizes of spores and other fungous structures vary,

depending upon the environment in which these structures are produced. Furthermore, the symptoms of the disease caused by the Philippine *Cercospora* agree very closely with those of the disease caused by *Cercospora kopkei* as described by Saccardo (1884), Bell (1929), and Reyes (1950). The writers, therefore, conclude that the fungus of the Philippine yellow leaf spot of sugar cane is identical with *Cercospora kopkei* Krüger.

PATHOGENICITY

To test the pathogenicity of the fungus, sugarcane cuttings and plants at various stages of development were inoculated. Since the fungus could not be grown on artificial media, the inoculum used in all experiments was obtained from diseased materials in the field. All plants were grown from one-node cuttings which had been disinfected with a 1:1000 solution of mercuric bichloride and thoroughly rinsed with sterile water.

Inoculation of sugarcane plants: *Experiment 1.* On September 10, 1952, heavily infected leaves bearing abundant spores were carefully scraped with a sterile razor blade, and the conidia were suspended in sterile water in an atomizer. Ten 30-day-old sugarcane plants, growing in pots of sterilized soil, were thoroughly sprayed with the spore suspension. Before inoculation the leaves were wiped with absorbent cotton moistened with sterile water. Five plants of the same variety and age were sprayed with sterile water alone. The inoculated and control plants were placed inside the damp chamber for 24 hours. On the following day they were transferred outside the laboratory and observed for the appearance of the disease. The earliest symptom of infection appeared on the inoculated plants 9 to 18 days after inoculation. The control plants remained healthy throughout the period of observation.

Experiment 2. Another experiment similar to the preceding one was conducted on October 12, 1952. The 60-day-old sugarcane plants were inoculated with spore suspension, and five plants were used as control. All other treatments given to the plants were the same as those in experiment 1.

Characteristic symptoms were noted on the leaves of the inoculated plants in practically the same number of days after inoculation as in experiment 1. However, a greater number of spots developed on the plants in this experiment than in the previous one. This is perhaps due to the fact that the leaves of the 60-day-old plants were larger than those of the 30-day-old ones and, hence, caught more of the spores that were sprayed on them. The check plants kept under similar conditions remained healthy throughout the experiment.

Inoculation of the soil. On November 12, 1952, one-node cuttings which had been disinfected were planted in pots containing a mixture of sterilized soil and spores scraped off diseased leaves. The pots were watered regularly and the plants that developed from the

cuttings were observed daily for the appearance of yellow spot. The earliest visible symptom of the disease appeared 34 days after planting. The spots appeared mostly on the two oldest leaves of the infected plants. All ten plants were infected, but they varied slightly in the number of spots. No infection was observed on the plants grown in sterilized soil alone.

Inoculation of sugarcane cuttings. Ten cuttings were immersed in a heavy spore suspension of the fungus and five were immersed in sterile water. Afterwards each cutting was planted in a pot of sterilized soil. The pots were placed outside the laboratory, watered regularly, and observed for the occurrence of infection. All plants, treated and control, remained healthy throughout the two-month period of observation. The results of this experiment indicate that although spores of *Cercospora kopkei* are present on the cuttings at the time of planting, they cannot infect the plants that develop from the cuttings. The failure of these spores to cause infection may be explained by the fact that they lose their viability in a short period and are no longer infective by the time the young leaves are out of the soil.

Varietal response to the disease. All varieties of sugar cane grown in the College of Agriculture and its vicinity are attacked by the disease, but not with the same degree of severity, indicating that some varieties are more susceptible than others. An experiment was conducted to determine the response to yellow spot of the following commercially grown cane varieties: POJ 2878, POJ 2883, POJ 2961, POJ 2714, H32-8560, H37-1933, PSA 76, PSA 132, F 108, F 109, M 1900, College 39, and Alunan. Five two-month-old plants of each variety were inoculated with spore suspension of the fungus. The inoculated plants were given the same treatments as those employed in the previous inoculation experiments in which spore suspension was used. Based on the number of spots produced to a leaf and the number of diseased leaves to a plant, the varieties may be classified into the following groups:

Heavily infected:

POJ 2878	H32-8560
College 39	POJ 2961
H37-1933	POJ 2883

Moderately infected:

POJ 2714	PSA 76
M 1900	PSA 132

Slightly infected:

F 108
F 109
Alunan

POJ 3016 was not tested in the laboratory on account of the unavailability of planting materials. However, observations on the standing canes in the Central Experiment Station showed that this variety is highly susceptible. A survey of the sugarcane fields at Canlubang [3] revealed that the reactions of the cane varieties to the disease were more or less the same as those indicated in the above groupings, with the exception of POJ 2883 and POJ 2961. These two POJ varieties were only moderately susceptible to yellow spot in the field.

Host range. Cross-inoculation experiments were conducted to determine whether or not *Cercospora kopkei* will infect plants other than sugar cane. The following weeds commonly found in and around the sugarcane fields were tested: Para grass (*Panicum purpurascens* Raddi), "bulak-manok" (*Ageratum conyzoides* L.), "kulape" (*Paspalum conjugatum* Berg.), calopogonium (*Calopogonium muconoides* Desv.), "talahib" (*Saccharum spontaneum* L.), "batad-bataran" [*Andropogon halepensis* (L.) Brot.], and *Pennisetum purpureum* Schumach.[4] The plants were grown in pots and inoculated with spore suspension of the fungus taken from diseased sugarcane leaves. The treatments given the plants were exactly the same as those employed in the inoculation experiments of sugar cane. Control plants were provided for each species.

Of the seven species inoculated, *Saccharum spontaneum* proved to be the only one susceptible to the disease. The lesions on this plant were similar to those on sugar cane, but they were smaller in size. The rest of the species were not infected even after repeated sprayings with spore suspension. Saccardo (1884) reported that besides sugar cane, *Cercospora kopkei* infects *Saccharum edulis, Saccharum glongong,* and *Saccharum spontaneum.*

LIFE HISTORY OF THE CAUSAL FUNGUS IN RELATION TO PATHOGENESIS

Seasonal occurrence of the disease in the field. Field observations have shown that the disease is hardly noticeable, if not totally absent, during the dry season. In Los Baños and Canlubang, it is still prevalent in March and in the early part of April but practically absent in the later part of April up to the early part of June, possibly because of low soil moisture as well as low atmospheric humidity. At the start of the rainy season in the early part of July, new infections appear on the lowermost leaves of the plants. As the rainy season advances, the incidence and severity of the disease increase. The writers observed that in September, almost all the plants in the field were infected in varying degrees of severity. This seems to indicate that moisture is one of the important factors influencing

[3] The writers are indebted to Mr. Cesar Mamon of the Canlubang Sugar Estate for help given in the survey of the cane fields and for providing the planting materials of the different varieties.

[4] The plants were identified by Mr. Juan V. Pancho, of the Department of Agricultural Botany.

the development of the disease. Welles (1925) reported that several species of *Cercospora* formed larger fruiting structures during periods of heavy precipitation than during dry weather. From this observation, he concluded that moisture must play some part in the development of these fungi.

Methods of infection. Inoculation experiments have shown that *Cercospora kopkei* is capable of infecting uninjured leaves, presumably through the stomatal openings. It is also probable that infection in the field takes place through injuries caused by insects and by man during cultural operations.

Methods of dissemination. Spore-catching experiments in which vaseline-coated glass slides were used showed that spores of the fungus can be disseminated by wind. Periodic strong winds and typhoons may dislodge the spores from diseased leaves and carry them to great distances. Spores and vegetative parts of the fungus may also be disseminated by insects as well as by man, animals, and mechanical agents during cultural operations. Rain splashes are probably not important in long-distance dissemination of spores, but they serve as important agents in the spread of the causal fungus from the infested soil to the leaves that are close to the ground.

Methods of living over from season to season. Diseased sugarcane leaves left in the field after harvest contain an abundance of mycelium and spores of the fungus. The mycelium, unlike the spores, remains viable for longer periods and constitutes the chief means by which the fungus tides over from the end of one sugarcane crop season to the beginning of the next. It has been found that *Cercospora kopkei* can infect talahib. In the absence of sugar cane in the field, the fungus may exist on this weed host from which it may be disseminated to sugar cane sometime during the cane-growing season.

Sources of inoculum. The mycelial fragments from the disintegrating diseased cane trash in the field may be carried by rain splash from the soil to the leaves and cause primary infection thereon. Infection of a new sugarcane crop may also be initiated by spores coming from talahib, which is a weed host of the fungus. The standing diseased plants, on which abundant spores may be produced, serve as a source of inoculum for secondary infection of neighboring or distant cane plants.

CONTROL MEASURES

Sanitation. The practice of burning the trash after harvest is an excellent means of reducing, if not totally eliminating, the sources of inoculum for the next crop. Since the fungus can be disseminated to considerable distances by various agents, burning should be done not only in random areas but throughout the plantation or, if possible, throughout the sugarcane region. Talahib, which is likely to harbor the pathogen, should be destroyed completely.

Cultural practices. Abundant moisture greatly favors the development of the disease. It is, therefore, essential that the field be properly drained so that the excess water will not remain in the soil after periods of heavy precipitation. The resulting reduced evaporation from the soil will lower the humidity of the atmosphere beneath the dense foliage and check the rapid development of the fungus on the infected leaves.

Planting of resistant varieties. All the varieties observed by the writers were attacked by the disease in varying degrees of severity. So far, no highly resistant or immune varieties have been found, but there is a possibility that such varieties can be developed through breeding. For the present, it is recommended that slightly susceptible varieties be substituted for the highly susceptible ones so that losses due to the disease may be reduced to the minimum.

Preliminary test of fungicides. An experiment was conducted in the laboratory to test the effectiveness of two commercial fungicides against *Cercospora kopkei.* The two fungicides used were "530 Spraycop," a basic copper fungicide containing 53.0% basic copper sulfate equivalent to metallic copper and 47.0% inert ingredients, and "Fermate," an organic fungicide based on ferric dimethyl dithiocarbamate.

Plants sprayed with "Spraycop" at concentrations of 0.1 to 0.3 per cent were slightly infected. The minimum concentration which completely protected the sugarcane plants from the disease was 0.4 per cent. Applications of "Fermate" at concentrations of 0.2 to 0.4 per cent were all effective against the pathogen. To avoid spray injury on the foliage, minimum dosage should be applied. In this experiment the writers found that the minimum concentrations required to protect the plants completely from the disease were 0.4 per cent for "530 Spraycop" and 0.2 per cent for "Fermate." Since this experiment was conducted in the laboratory, no definite statement can be made as to whether or not these concentrations will give adequate protection to the plants in the field. Further studies on the time and frequency of application of fungicides should be made in the field.

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TABLE 1

Distribution of lengths and widths of 100 hyphal cells of Cercospora kopkei

LENGTH CLASS IN MICRONS	NUMBER OF HYPHAL CELLS	WIDTH CLASS IN MICRONS	NUMBER OF HYPHAL CELLS
10.0–11.99	3	2.0–2.99	34
12.0–13.99	10	3.0–3.99	60
14.0–15.99	57	4.0–4.99	6
16.0–17.99	—	—	—
18.0–19.99	—	—	—
20.0–21.99	—	—	—
22.0–23.99	—	—	—

Average size of hyphal cells = 15.82 ± 0.05 × 3.27 ± 0.21μ

TABLE 2

Distribution of lengths and widths of 200 conidiophores of Cercospora kopkei

LENGTH CLASS IN MICRONS	NUMBER OF CONIDIOPHORES	WIDTH CLASS IN MICRONS	NUMBER OF CONIDIOPHORES
38.0–39.9	1	3.0–4.9	7
40.0–41.9	2	5.0–6.9	188
42.0–43.9	2	7.0–8.9	5
44.0–45.9	10	—	—
46.0–47.9	31	—	—
48.0–49.9	38	—	—
50.0–51.9	47	—	—
52.0–53.9	35	—	—
54.0–55.9	20	—	—
56.0–57.9	5	—	—
58.0–59.9	2	—	—
60.0–61.9	1	—	—
62.0–63.9	1	—	—
64.0–65.9	1	—	—

Average size of conidiophores = 50.67 ± 0.22 × 5.26 ± 0.03μ

TABLE 3

Ratio of length to width of 200 conidiophores of Cercospora kopkei distributed in classes made by a difference of 0.5

RATIO CLASS 1:	NUMBER OF CONIDIOPHORES
7.0– 7.49	1
7.5– 7.99	2
8.0– 8.49	7
8.5– 8.99	5
9.0– 9.49	72
9.5– 9.99	47
10.0–10.49	54
10.5–10.99	4
11.0–11.49	2
11.5–11.99	1
12.0–12.49	1
12.5–12.99	0
13.0–13.49	1
13.5–13.99	3
Average ratio = 9.70	

TABLE 4

Distribution of lengths and widths of 200 conidia of Cercospora kopkei

LENGTH CLASS IN MICRONS	NUMBER OF CONIDIA	WIDTH CLASS IN MICRONS	NUMBER OF CONIDIA
22.0–23.9	1	5.0–6.9	37
24.0–25.9	1	7.0–8.9	163
26.0–27.9	1	—	—
28.0–29.9	14	—	—
30.0–31.9	17	—	—
32.0–33.9	28	—	—
34.0–35.9	41	—	—
36.0–37.9	44	—	—
38.0–39.9	28	—	—
40.0–41.9	12	—	—
42.0–43.9	10	—	—
44.0–45.9	3	—	—

Average size of conidia = 35.75 ± 0.26 × 6.71 ± 0.05μ

TABLE 5

Ratio of length to width of 200 conidia of Cercospora kopkei distributed in classes made by a difference of 0.5

RATIO CLASS 1:	NUMBER OF CONIDIA
3.00–3.49	1
3.50–3.99	1
4.00–4.49	9
4.50–4.99	31
5.00–5.49	74
5.50–5.99	39
6.00–6.49	24
6.50–6.99	8
7.00–7.49	12
7.50–7.99	1

Average ratio = 5.39

THE VALUE OF WATER HYACINTH AS SILAGE [1]

FILOMENO M. AGRUPIS

WITH ONE TEXT FIGURE

Of three different kinds of silage, water hyacinth had the lowest temperature. Para grass silage had the lowest moisture content and so was richest in dry matter. Water hyacinth silage was the most succulent and so was lowest in dry matter. The Para grass and water hyacinth mixture had the best calcium-phosphorus ratio and the highest yield of silage.

The daily average consumption of Red Sindhi cows used in the experiment was 11.13 kg. of Para grass silage, 12.83 kg. of the mixture of Para grass and water hyacinth silage, and 15.33 kg. of water hyacinth silage. The average silage consumption for every 100 kilograms live weight was 5.51 kg. of Para grass silage, 6.37 kg. of the mixture of Para grass and water hyacinth silage, and 7.35 kg. of water hyacinth silage.

Silage prepared in the rainy season when plant growth is greatest can provide animals with succulent roughage during summer. As an added advantage, McCandlish (1922) stated that silage keeps for a relatively long period of time. While some of it is spoiled by age, the greater portion remains in a desirable condition. It does not fluctuate in feeding value.

Since 1929 the College of Agriculture has been feeding its dairy animals with silage during summer (Esguerra, 1948). Because corn is too costly for silage making, it was thought advisable to try other plants. Water hyacinth [*Eichhornia crassipes* (Mart.) Solms], which is abundant in lakes, rivers, creeks, and marshy places in the Philippines, would be a good feed if it could be successfully ensiled. This investigation was performed in the Department of Animal Husbandry from May, 1952, to January, 1953, (1) to determine whether water hyacinth can be successfully made into silage, (2) to find out if equal weights of Para grass and water hyacinth make better silage than either Para grass or water hyacinth alone, (3) to ascertain which of the three kinds of silage is richest in nutrients, and (4) to compare the palatability of each silage for cattle.

MATERIALS AND METHODS

Para grass (*Panicum purpurascens* Raddi), which was used as control, was harvested at maturity. Water hyacinth was gathered from Laguna de Bay at Masili, Calamba, Laguna. The average height of the plants was 36.0 centimeters. The molasses used as preservative came from the Real Compania de Azucarera in Real,

[1] Central Experiment Station Contribution No. 1702. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Animal Husbandry under the direction of Professor Valente Villegas.

Calamba, Laguna. Its proximate analysis as determined at the Central Experiment Station Chemical Laboratory was as follows:

	per cent
Moisture	20.85
Crude protein	0.81
Ether extract	1.81
Nitrogen-free extract	69.27
Crude fiber	0.00
Ash	7.27
Calorific value for every 100 grams	297.00

Six pit silos were used in this experiment. The volumes of the silos were as follows:

	cu. m.
Silo A	1.32
" B	1.08
" C	1.07
" D	1.07
" E	1.08
" F	1.06

Para grass and water hyacinth were cut separately with a John Deere Model G tractor and an International Company No. 7 ensilage cutter. To facilitate handling, the plants were tied together in bundles with diameters of about sixty centimeters each. The fresh chopped Para grass and water hyacinth were weighed separately and dipped separately into a drum of molasses solution for two to three minutes. The solution consisted of one part of molasses and four and one-half parts of water, all parts by weight. In the case of the Para grass and water hyacinth mixture, the two forages were weighed separately and mixed thoroughly before being dipped in the molasses solution. In the process of filling the silos, the materials were tamped thoroughly to minimize the presence of air spaces in the feed. Silage which is not well packed permits air pockets which favor the growth of molds and undesirable bacteria (Olson, 1950).

To avoid top spoilage as much as possible, chopped and unchopped Para grass was used as cover. The chopped material was placed immediately next to the ensiled forage; on top was placed the unchopped material. Stones were then put on top of the unchopped Para grass to help drive out air from the chopped feed.

In the middle of each silo was placed a rectangular box (10.2 $\times$ 10.2 $\times$ 71.1 cm.) with a sliding galvanized iron sheet on one side. The temperature of the silage was first read when the silage was one day old; then weekly readings were taken. The sliding sheet of the test box was pulled so a thermometer could be inserted into the silage at a depth of 77 centimeters. After about four minutes, the reading was taken. The sliding galvanized iron sheet was again placed in position and the box was closed.

Two trials were performed. The first trial was from June 19 to September 15, 1952; the second, from November 14, 1952, to Jan-

uary 30, 1953. In the first trial, 278.5 kg. of Para grass, 298.5 kg. of the Para grass and water hyacinth combination, and 489.5 kg. of water hyacinth were used; in the second trial, 410 kg. of Para grass, 345.5 kg. of the mixture of Para grass and water hyacinth, and 420.0 kg. of water hyacinth. The three kinds of silage were preserved in the silos for two months.

Five mature Red Sindhi cows were used to test the palatability of the different kinds of silage. The weight of each animal was determined the day before feeding commenced. The weights of the animals used in the first trial were as follows: Laki, Herd No. 3, 211.0 kg.; Malir, Herd No. 5, 224.0 kg.; Aires, Herd No. 6, 192.0 kg.; and Kuniger, Herd No. 8, 181.0 kg. The average weight of the animals was 202.6 kg. In the second trial, the weights of the animals were the following: Malir, 270.0 kg.; Aires, 195.0 kg.; Nargi, Herd No. 12, 170.0 kg.; Deli, Herd No. 12, 281.0 kg.; and Kusa, Herd No. 24, 181.0 kg. The average weight of the animals was 219.2 kg.

The animals were fed the silage twice a day, in the morning and in the afternoon. At four o'clock in the afternoon they were turned loose in the pasture. In the first trial, the animals were fed with each kind of silage for six days; in the second trial, for five days. The silage was weighed and then fed to the animals. The leftover was weighed and the difference between the two weights represented the amount of silage consumed by each animal. The sum of the amounts eaten in the morning and in the afternoon made up the daily consumption of each animal.

In both trials, the animals were given Para grass first, the mixture of Para grass and water hyacinth next, and water hyacinth last.

RESULTS AND DISCUSSION

Temperature changes. Henderson, Larson, and Putney (1946) reported that one of the first changes which take place in silage after it has been put in the silo is an increase in temperature. The increase, however, is not great if air is excluded. In their study it was 15°F. (8.3°C.) near the bottom and 35°F. (19.4°C.) near the top. Vera Cruz (1951) obtained a range of 40.0°C. to 41.5°C., or an average of 41.22°C., in day-old silage. The average temperature of week-old silage was 41.89°C., or an increase of only 0.67°C. over the temperature of day-old silage. The temperature decreased as the silage became older.

In the present study a similar trend in the temperature changes was observed. The temperature of Para grass silage ranged from 34.2°C. to 45.6°C., or an average of 39.9°C; that of the mixture of Para grass and water hyacinth, from 35.5°C. to 42.3°C., or an average of 38.9°C.; and that of water hyacinth silage, from 32.1°C. to 36.6°C., or an average of 34.4°C. The average temperature of all the kinds of silage was 37.73°C.

The temperature of the silage after one day was 41.4°C. for Para grass, 37.7°C. for the mixture of water hyacinth and Para grass,

and 34.2°C. for water hyacinth. After one week the temperature of Para grass silage increased by 3.8°C.; that of the mixture of Para grass and water hyacinth, by 3.4°C.; and that of the water hyacinth silage, by 2.0°C. The highest temperature was registered two weeks after ensiling. Para grass had a temperature of 45.6°C.; the mixture of Para grass and water hyacinth, 42.3°C.; and water hyacinth, 36.6°C. After the second week the temperature began to decrease. After nine weeks or two months the temperature of Para grass silage was 34.3°C., that of the mixture of Para grass and water hyacinth silage was 33.5°C., and that of water hyacinth silage was 32.1°C.

In both trials water hyacinth silage had the lowest temperature. This might have been due to its having a higher moisture content than Para grass. The Para grass and water hyacinth mixture had a temperature that was intermediate between the two other kinds of silage. (fig. 1).

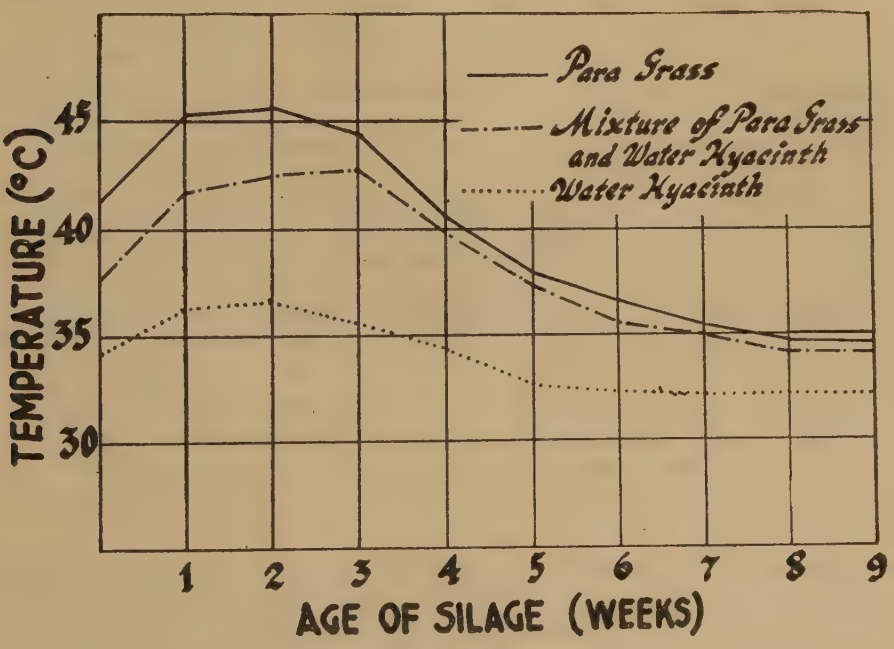

Fig. 1.—Weekly temperature changes of the three kinds of silage.

Yield of silage. Vera Cruz (1951) reported an average of 83.43 per cent of silage from Napier grass. The percentages of yield of good silage in the present study are shown in table 1. Silo A with Para grass and silo D with water hyacinth suffered from top spoilage. The average yield of silage was lower by 5.65 per cent than that reported by Vera Cruz. The Para grass and water hyacinth combination gave the highest percentage of yield of silage.

Proximate analysis. The comparative proximate analysis of the kinds of silage (table 2a) shows that Para grass silage had the lowest moisture content and so was richest in dry matter. Water hyacinth silage was the most succulent and so was lowest in dry matter.

Mineral contents. The comparative mineral contents of the kinds of silage (table 2b) shows that Para grass silage had the highest phosphorus content; it had an average of 0.23 per cent calcium. Water hyacinth silage had 0.28 per cent calcium and 0.09 per cent phosphorus. The mixture of Para grass and water hyacinth silage had the highest calcium content, but had a lower phosphorus content than Para grass silage.

The calcium-phosphorus ratio was best in the mixture of Para grass and water hyacinth; it was almost two of calcium to one of phosphorus. According to Morrison (1951), this is the proper ratio of the two minerals.

Silage consumption. Sarao and Esguerra (1930) observed that some of the animals used in their study did not relish corn silage at the first feeding; however, the animals ate the feed after a little common table salt had been mixed with the silage. In this experiment, the animals were reluctant to take the water hyacinth silage even after salt had been added. The feeding of water hyacinth was therefore discontinued and the silo containing it was closed. The mixture of Para grass and water hyacinth was next fed to the cows. It was surprising to see the animals eat this kind of silage which also contained water hyacinth. After the animals had been fed this silage for six days, water hyacinth silage was tried again. This time the animals relished the feed. The water hyacinth in the mixture was probably the cause for the animals' eating the pure water hyacinth silage later.

The average consumption of Para grass silage ranged from 9.52 to 13.52 kg., or an average of 11.52 kg.; of the mixture of Para grass and water hyacinth silage, 10.01 to 14.53 kg., or an average of 12.27 kg.; and of water hyacinth silage, 12.79 to 17.97 kg., or an average of 15.38 kg.

In the first trial, Malir consumed 14.45 kg. of Para grass silage; Laki, 15.96 kg. of the mixture of Para grass and water hyacinth and 22.37 kg. of water hyacinth silage. Based on consumption for every 100 kg. live weight, Kuniger ate 7.02 kg. of Para grass silage and 7.57 kg. of the Para grass and water hyacinth mixture; Laki, 10.60 kg. of water hyacinth silage.

In the second trial, Aires consumed 10.02 kg. of Para grass silage; Malir, 11.32 kg. of the mixture of Para grass and water hyacinth and 15.60 kg. of water hyacinth silage. The average daily consumption for every 100 kg. live weight was 5.61 kg. of Para grass silage and 5.64 kg. of the Para grass and water hyacinth mixture for Nargi and 6.83 kg. of water hyacinth silage for Aires.

Miscellaneous observations. There was no hydrocyanic acid in the Para grass and the water hyacinth silage.

The colors of the different kinds of silage varied. Water hyacinth silage had the best color; it was yellow or amber. Para grass silage was dull brown-yellow. The mixture of Para grass and water hyacinth silage had a color that was intermediate between the two.

Fungus growth was noticeable in Para grass placed in silo A. Evidently, this was due to the entrance of air through the side adjoining the spoiled silage. Although the other silos suffered from fungus growth, the silage was not greatly damaged because the fungi were mostly on the top layer.

The average weight of the animals at the start of feeding in the first trial was 202.6 kg.; at the end of the feeding period it was 217.4 kg. In the second trial, the average weight of the animals at the start of the feeding period was 219.2 kg.; it was 202.2 kg. at the end of the feeding period.

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TABLE 1

Amount of fresh forage used and yield of good silage

TRIALS	PARA GRASS			MIXTURE OF PARA GRASS AND WATER HYACINTH			WATER HYACINTH		
	Fresh forage	Yield		Fresh forage	Yield		Fresh forage	Yield	
		Silage	Percentage		Silage	Percentage		Silage	Percentage
	kg.	*kg.*		*kg.*	*kg.*	*kg.*	*kg.*	*kg.*	
I	278.50	259.00	93.00	298.00	283.00	94.97	489.50	317.50	64.86
II	410.00	281.00	68.54	345.50	272.00	78.73	420.00	300.60	71.57
Average	344.25	270.00	78.43	321.75	277.50	86.25	454.25	309.05	68.04

TABLE 2a

Proximate analyses of three kinds of silage [a]

NUTRIENT	PARA GRASS	MIXTURE OF PARA GRASS AND WATER HYACINTH	WATER HYACINTH
	per cent	*per cent*	*per cent*
Moisture	77.94	82.33	90.65
Crude protein (N × 6.25)	1.57	1.02	0.85
Carbohydrates (N.F.E.)	9.16	7.48	3.93
Crude fats (ether extract)	1.22	1.56	0.39
Crude fibers	6.80	4.69	2.17
Ash	3.31	2.92	2.01
Calorific value for every 100 grams	54.00	48.00	23.00

TABLE 2b

Mineral contents of three kinds of silage [a]

MINERAL	PARA GRASS	MIXTURE OF PARA GRASS AND WATER HYACINTH	WATER HYACINTH
	per cent	*per cent*	*per cent*
Calcium	0.36	0.38	0.28
Phosphorus	0.23	0.17	0.09

[a] Analyzed at the Central Experiment Station Chemical Laboratory.

DRIED BREWERS' YEAST AS A SUPPLEMENT TO A RATION FOR GROWING CHICKS [1]

MARIO O. SAN JUAN

WITH ONE TEXT FIGURE

The birds in the control lot were slightly heavier than those that received the experimental ration, but the difference was not significant. Dried brewers' yeast did not unfavorably affect the palatability of the feed.

There was no significant difference in mortality between the chicks that received dried brewers' yeast in the ration and those that did not. The returns above feed cost were practically the same in both lots. From the point of view of economy of meat production, dried brewers' yeast may be profitably utilized in rations for growing chicks in the proportion of one to ten.

Most feeds for growing chicks in the Philippines include fish meal as a source of protein, but poultry raisers find it difficult to obtain this important ingredient especially when prices are high. Dried brewers' yeast was reported by Heuser (1946) to be a good source of both proteins and vitamin B complex. To determine the influence of dried brewers' yeast as a supplement to a ration for growing chicks, this study was conducted in the Department of Animal Husbandry from December, 1948, to November, 1949.

Heuser (1946) described brewers' dried yeast as the properly dried yeast filtered from beer after fermentation. It contains not less than 45 per cent protein on the moisture-free basis. Morrison (1949) stated that brewers' dried yeast is used mostly as a supplement, especially for poultry. He stated further that its special value as a supplement lies in its high content of riboflavin, niacin, thiamin, panthothenic acid, and other B-complex vitamins.

Schlamb and Winter (1948) found that the substitution of 5 or 10 per cent dried distillers solubles, or 10 to 15 per cent distillers dried grains with solubles, for part of corn and soybean oil meal in a chick ration containing no animal protein, but adequately fortified with riboflavin, resulted in optimum growth, good feathering, and efficient feed utilization during the first 12 weeks when the chickens were raised on litter.

Fronda and Fronda (1948) reported that distillery yeast may be profitably used in poultry rations, either for growing chicks or for layers. The product that these investigators used was obtained from La Tondeña Distillery in Manila in a form similar to moist

[1] Central Experiment Station Contribution No. 1703. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Animal Husbandry under the direction of Professor F. M. Fronda.

black mud and with a very strong alcoholic odor. Before being incorporated in the ration, it had to be thoroughly air-dried and ground.

Schaible (1948) reported that at Ohio State University, New Hampshire chickens were fed throughout their life cycle with an all-vegetable-protein ration alone, supplemented by distillers feeds with or without a small amount of animal or fish protein. He observed that the all-vegetable-protein ration was improved for growth with 5 per cent solubles or with 10 per cent dark grains to which fish meal or meat scraps had been added.

MATERIALS AND METHODS

In the present study, 300 day-old New Hampshire chicks were used. Three trials were conducted. The chicks were legbanded and divided into two lots consisting of 50 chicks each. Lot I was the control lot and lot II, the experimental lot. Each trial covered a period of 12 weeks. The first trial started on February 8, 1949, and ended on April 26, 1949; the second trial started on March 22, 1949, and terminated on June 14, 1949; and the third trial began August 31, 1949, and ended November 23, 1949. The chicks were confined in adjoining compartments with cement floors and with rice hull as litter. They were kept at night in a fireless artificial brooder.

The rations given to the chicks consisted of the following ingredients, all parts by weight:

	CONTROL RATION (LOT I)	EXPERIMENTAL RATION (LOT II)
Fine rice bran	55	55
Ground corn	20	20
Copra meal	5	5
Fish meal	20	10
Dried brewers' yeast	—	10
Total	100	100

The dried brewers' yeast used in this study was supplied by San Miguel Brewery, Manila. It is similar to copra meal, only lighter in color, and has a slight alcoholic odor. The dry yeast was ground before it was mixed in the ration.[2]

The feeds were given dry in sufficient amounts three times a day: morning, noon, and in the later part of the afternoon. Excess feeds left in the trough by both lots were removed separately at the end of each week so that the amounts of feed consumed could be determined. Fresh drinking water, ground shells, and grit were accessible to the birds throughout the experiment. Chopped green feed, either camote tops or leaves of *Centrosema pubescens* Benth., was given separately three times a week to both lots.

[2] Analysis of Morrison's "Feeds and Feeding" (1949) shows that dried brewers' yeast contains 49.3 per cent protein and 1.56 per cent phosphorus.

Records of the initial and weekly weights of the chicks, amount of feed consumed, and mortality were kept.

RESULTS AND DISCUSSION

Rate of growth. The average weekly weights of the New Hampshire chicks at different ages (table 1 and fig. 1) were used to deter-

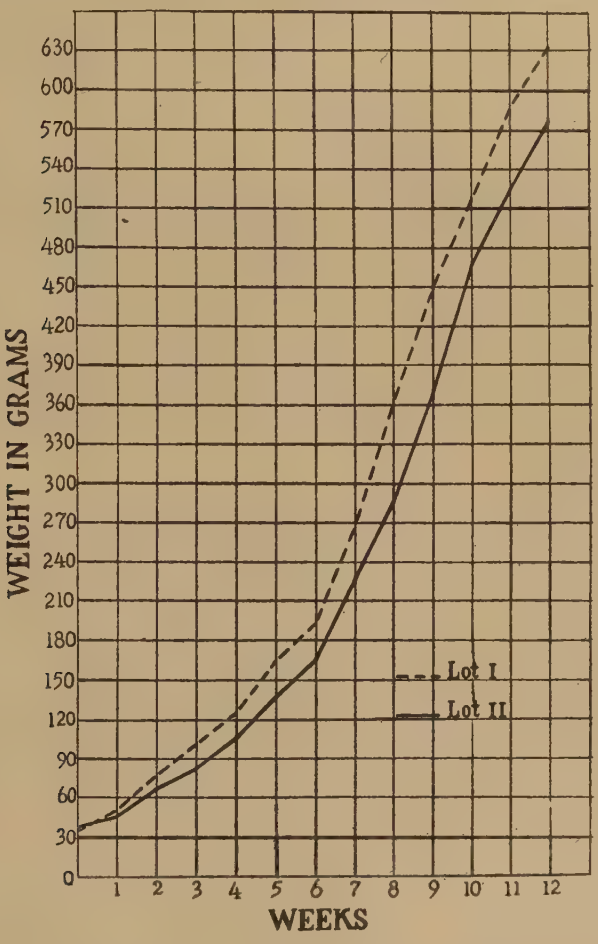

Fig. 1.—Average weekly weights of the New Hampshire chicks.

mine the influence of the feed on growth. The chicks in the control lot had an average initial weight of 36.59 $\mp$ 0.21 grams, and those in the experimental lot had an average weight of 36.80 $\mp$ 0.23 grams. There was an insignificant difference of 0.21 gram. At the age of two weeks, the chicks in lot 1 doubled their initial weights, but those

in the experimental lot did not. Although both lots apparently gained in weight normally up to the end of the experiment, the chicks in lot I were always heavier at any age than those in lot II. The chicks had the greatest gains from the ninth to the twelfth week. Lot I had a higher average final weight than lot II; the difference, however, was insignificant. These results are in conformity with those reported by Schlamb and Winter (1948).

The following formula advanced by Asmundson and Lerner (1942) was used in the computation of the rate of growth:

$$R = \frac{W_2 - W_1}{\frac{1}{2}(W_2 + W_1)} \times 100$$

where W_2 is the weight at the end and W_1 the weight at the beginning of the period considered. Table 2 shows that the weekly gains in weight and rates of growth were very irregular in both lots. The chicks in lot II had the lowest gain in weight during the fifth week. Both lots made the greatest gain from the seventh to the eleventh week. The mean weekly gain of the birds in lot I was 38.38 grams, and in lot II, 30.69 grams. A mean weekly gain of 34.1 grams was obtained by Fronda and Fronda (1948) when distillery yeast was fed to Nagoya chicks. The birds in the check lot gained 7.29 grams more than those in the experimental lot. The difference, however, was insignificant.

Feed consumption and returns. Table 3 shows that the experimental birds (lot II) consumed 11 more kilograms of feed than those in the control (lot I). The figures indicate that dried brewers' yeast did not adversely affect the palatability of the experimental ration.

When the amount of feed needed to produce a kilogram gain in weight was considered, the control birds needed only 4.76 kilograms and the experimental birds, 4.88 kilograms. These results show that the ration containing dried brewers' yeast was not as efficient as the control ration. Although the amount of feed consumed by the birds in lot I was only a little less than that consumed by the birds in lot II, because of the more efficient ration given to lot I, greater gain in weight was realized in this lot than in lot II.

In spite of the higher efficiency of the ration used in lot I than that used in lot II, the returns above the cost of feed were practically the same in both lots. From the standpoint of economy of meat production, therefore, the experimental ration compared favorably with the control ration.

Mortality. For the 12-week period, the percentage mortality (table 4) was higher in lot II, perhaps partly because of the addition of dried brewers' yeast to the ration. In both lots, the diseases that caused the deaths of the chicks were coccidiosis, roup, and fowl pox. It is probable that the chicks that received the ration contain-

ing dried brewers' yeast were not as healthy as those that received the control ration; hence, more of them succumbed to the diseases. In both lots, the heaviest mortality occurred during the fourth and fifth weeks.

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TABLE 1

Average weekly weights of New Hampshire chicks fed the control and experimental rations

AGE	LOT I	LOT II
	grams	*grams*
1 day	36.6 ∓ .21	36.8 ∓ .23
1 week	47.5 ∓ .60	46.7 ∓ .54
2 weeks	74.1 ∓ 1.24	65.6 ∓ 1.09
3 weeks	96.4 ∓ 1.86	82.6 ∓ 1.71
4 weeks	124.8 ∓ 3.02	104.9 ∓ 2.75
5 weeks	164.7 ∓ 4.38	137.5 ∓ 3.95
6 weeks	190.7 ∓ 5.64	173.5 ∓ 6.39
7 weeks	265.5 ∓ 8.28	226.4 ∓ 8.26
8 weeks	357.5 ∓ 11.19	283.3 ∓ 10.80
9 weeks	446.9 ∓ 13.62	369.4 ∓ 12.99
10 weeks	514.8 ∓ 15.51	464.5 ∓ 15.13
11 weeks	588.5 ∓ 16.46	532.7 ∓ 16.70
12 weeks	631.6 ∓ 20.04	576.9 ∓ 21.87

TABLE 2

Average weekly gains and rates of growth of the New Hampshire chicks

AGE	LOT I		LOT II	
	Gain in weight	Rate of growth	Gain in weight	Rate of growth
	grams	*per cent*	*grams*	*per cent*
0– 1	11.6	27.3	10.4	24.6
1– 2	20.2	31.0	17.4	29.5
2– 3	20.7	23.4	4.5	5.5
3– 4	15.3	12.8	2.2	2.1
4– 5	17.7	11.1	1.3	0.9
5– 6	10.6	5.6	3.2	1.8
6– 7	42.7	17.0	39.4	18.8
7– 8	87.0	27.2	54.0	20.3
8– 9	89.9	22.0	81.0	24.0
9–10	71.7	14.7	86.7	20.2
10–11	64.1	11.4	66.6	13.2
11–12	9.1	1.4	1.7	

Pooled variance analysis

LOT	NUMBER OF WEEKS	DEGREES OF FREEDOM	MEAN	SUM OF SQUARES	COMPUTED "t" VALUE	TABULAR "t" 5%
I	12	11	38.38	10,394.97	0.558	2.074
II	12	11	30.69	12,144.01		

$df = 22$ $d = 7.29$ $\Sigma = 22,538.98$

TABLE 3

Amount of feed consumed and returns above feed cost (based on 100 chicks raised to 12 weeks of age)

ITEM	LOT I	LOT II
Total amount of feed consumed, kilograms	253.00	264.00
Total cost of feed in pesos [a]	45.54	38.02
Average feed consumption of each bird, kilograms	2.53	2.64
Weanlings produced, kilograms	63.16	57.69
Returns from sale of weanlings, pesos [b]	94.74	86.53
Feed required for each kilogram gain, kilograms	4.76	4.88
Cost of feed required to produce a kilogram gain, pesos	.85	.78
Returns above cost of feed, pesos	49.20	48.51

[a] Excluding the dried brewers' yeast, the control ration (lot I) cost ₱0.18 a kg. and the experimental (lot II) cost ₱0.16.

[b] Weanlings were valued at ₱1.50 a kg. live weight.

TABLE 4

Percentage of mortality

ITEM	LOT I	LOT II
Number of chicks at the start	150	150
Number of weanlings after 12 weeks	67	48
Number of chicks that died	83	102
Percentage of mortality	55.3	68.0

THE FEEDING VALUE OF TWO GRADES OF SIEVED "KISKIS" RICE BRAN FOR GROWING CHICKS [1]

RUPERTO A. VILLANOY

WITH FIVE TEXT FIGURES

"Kiskis" rice bran passed through 1-millimeter or 2-millimeter sieves can substitute satisfactorily for "Cono" rice bran in rations for growing chicks. Of the two grades, the finer kind is preferred.

Rice bran is one of the feedstuffs commonly available to poultrymen in many parts of the Philippines. It may be classified into two kinds. The standard or fine rice bran, which comes from large rice mills called "Cono" mills, is the kind preferred by most poultrymen. The other kind is the coarse rice bran containing ground rice hull, a product of small rice mills called "Kiskisan" mills. Since "Kiskisan" rice mills are used in most barrios and towns, only the coarse rice bran is available to poultry raisers in these places. Furthermore, "Kiskis" rice bran is cheaper than the standard or fine rice bran. To determine how the feeding value for growing chicks of two grades of sieved "Kiskis" rice bran compares with that of "Cono" rice bran, this study was conducted in the Department of Animal Husbandry from December, 1951, to February, 1953.

Since the experiment seems to open an entirely new field of study in local poultry feeding, literature pertinent to the subject is very limited. There have been, however, several studies on the comparative feeding value of coarse and fine rice bran in rations for growing pigs.

Tirol (1933) reported that from the standpoint of economy of gain, fine rice bran ranked first; coarse and fine rice bran combined, second; and coarse rice bran, last.

In a similar study with pigs, Valdez (1938) noted that the ration containing 60 per cent "Kiskis" rice bran was only 70.94 per cent as good as the ration containing fine rice bran. Based on the amount of feed consumed to make a kilogram gain in weight and considering the fine rice bran ration as 100 per cent efficient, the coarse rice bran ration was only 77.38 per cent as good, and the ration containing fine and coarse rice bran in equal proportions was 89.37 per cent as efficient as the fine rice bran ration.

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[1] Central Experiment Station Contribution No. 1704. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Animal Husbandry under the direction of Instructor Amado C. Campos.

MATERIALS AND METHODS

A total of 270 day-old New Hampshire chicks, 180 of which were from eggs laid by the College flock and the remaining 90 from eggs laid by the Santa Fe Poultry Farm flock,[2] was used in this study. Three series of experiments, each consisting of three lots with 30 chicks to a lot, were conducted. Immediately after hatch, the chicks were distributed at random in the three lots, legbanded, weighed, and placed in artificially heated battery brooders. After one month they were transferred to unheated battery cages. Weekly weighings were made until the chicks were 12 weeks old (fig. 1).

Fig. 1.—Left to right, representative birds from lots I, II, and III (first and second trials) showing the variation in the color of plumage.

Except for the kind of rice bran used, the rations for all the lots consisted of the same ingredients. These ingredients, all parts by weight, were as follows:

Rice bran	55
Ground corn	20
Copra meal	5
Fish meal	20
Common table salt—1 per cent of mash	

Finely chopped green feed was given to the chicks daily, and ground shells and grit were made available at all times. The ration in the form of dry mash was given to the chicks *ad libitum*. The birds had access to fresh water throughout the day.

[2] The chicks from the Santa Fe Poultry Farm were first-generation progeny of birds imported from the United States.

To lot I was given the standard or "Cono" rice bran; to lot II, "Kiskis" rice bran No. 1; and to lot III, "Kiskis" rice bran No. 2. "Kiskis" rice bran No. 1 was obtained by passing coarse and fine "Kiskisan" rice bran in equal parts by volume through a 1-millimeter sieve; "Kiskis" rice bran No. 2 was obtained similarly with the use of a 2-millimeter sieve. Thus, "Kiskis" rice bran No. 2 included the sizes contained in "Kiskis" rice bran No. 1 in addition to the particles which passed through the 2-millimeter sieve. The sieved samples of both grades of rice bran contained particles of broken rice (*binlid*) and ground rice hull in addition to the bran. Relatively more ground rice hull and broken rice were found in the 2-milimeter grade than in the 1-milimeter grade.

The average proximate analyses of the "Cono" rice bran and the two grades of sieved "Kiskis" rice bran used in this study, as determined by the Department of Agricultural Chemistry, are as follows:

CONSTITUENT	"CONO"	"KISKIS" NO. 1	"KISKIS" NO. 2
Moisture	12.70	12.01	11.22
Crude protein (N × 6.25)	9.44	4.13	6.52
Crude fats (ether extract)	14.27	7.05	7.18
Carbohydrates (N.F.E.)	50.29	43.26	41.44
Calorific value per 100 grams	367.00	253.00	257.00
Crude fibers	5.77	18.68	18.76
Ash	7.53	14.87	14.88

The care and management given to all the lots were practically the same throughout the experiment. Initial and weekly weights, amount of feed consumed and feed cost, mortality of the chicks, and other pertinent observations were recorded.

RESULTS AND DISCUSSION

Rate of growth. Lot III had weekly average weights consistently lower than those of lots I and II from the second to the twelfth week (table 1 and fig. 2). Chicks in lots II and I had practically the same weights from the first to the eight week of the feeding period. From then on, however, lot II lagged behind lot I until the twelfth week. The weights at this time were higher than those obtained by Diñgayan and Fronda (1950) and Baclig and Fronda (1949) for their control lots. The difference between the final weights of lots II and III was greater than the difference between the final weights of lots I and II. This disparity may be attributed to the greater amount of coarsely ground rice huli in the rice bran given to the lot III birds. Fraps (1916) reported that rice hull has a very low feeding value, but there is no evidence that it is poisonous or injurious to animals.

The rate of growth of the birds in trial I was very variable (fig. 3). Nevertheless, lot III showed consistently lower average weights than lots I and II. Lot II was practically on the same weight

level as lot I during the first three weeks and also from the sixth to the ninth week of the trial.

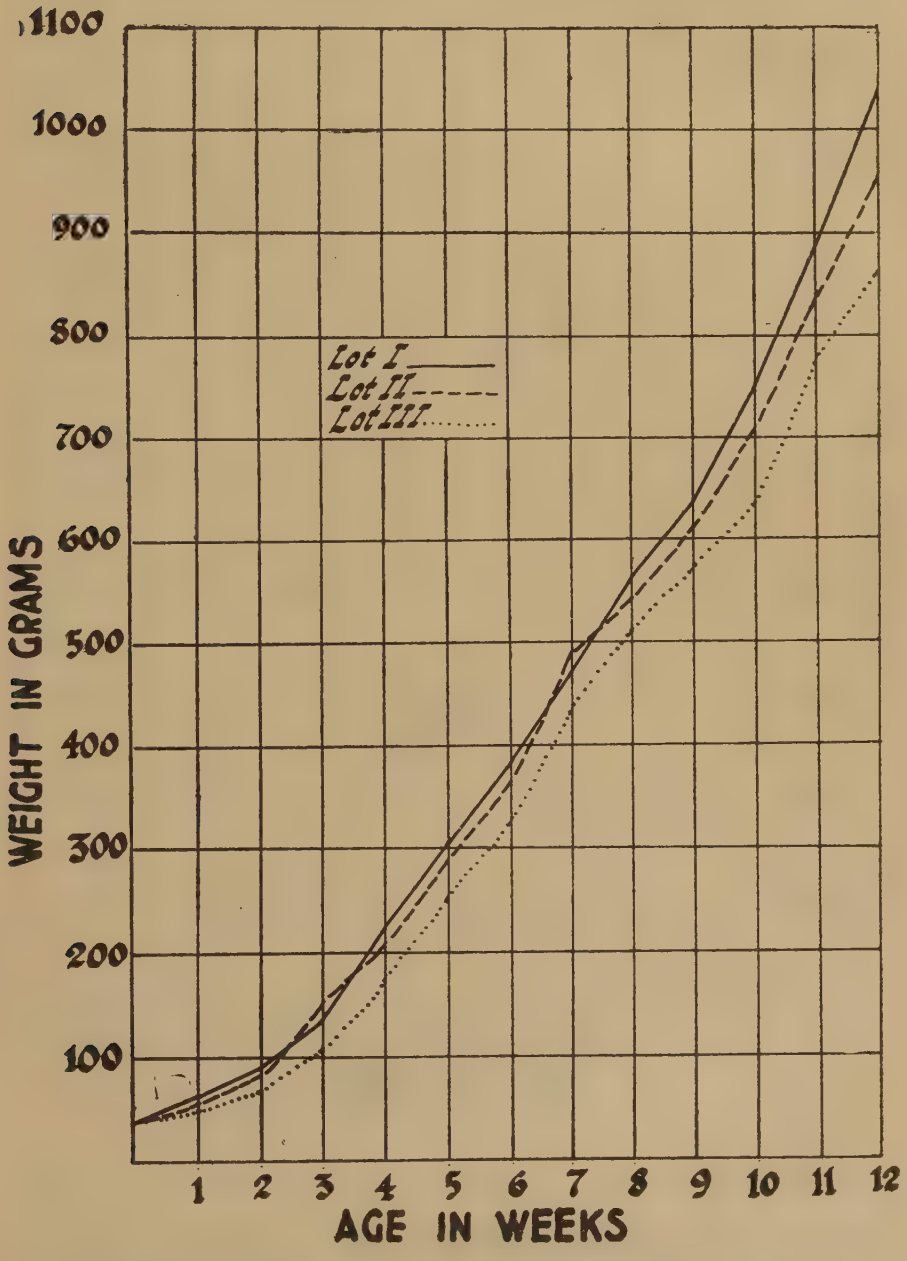

Fig. 2.—Average rates of growth of chicks in the three trials.

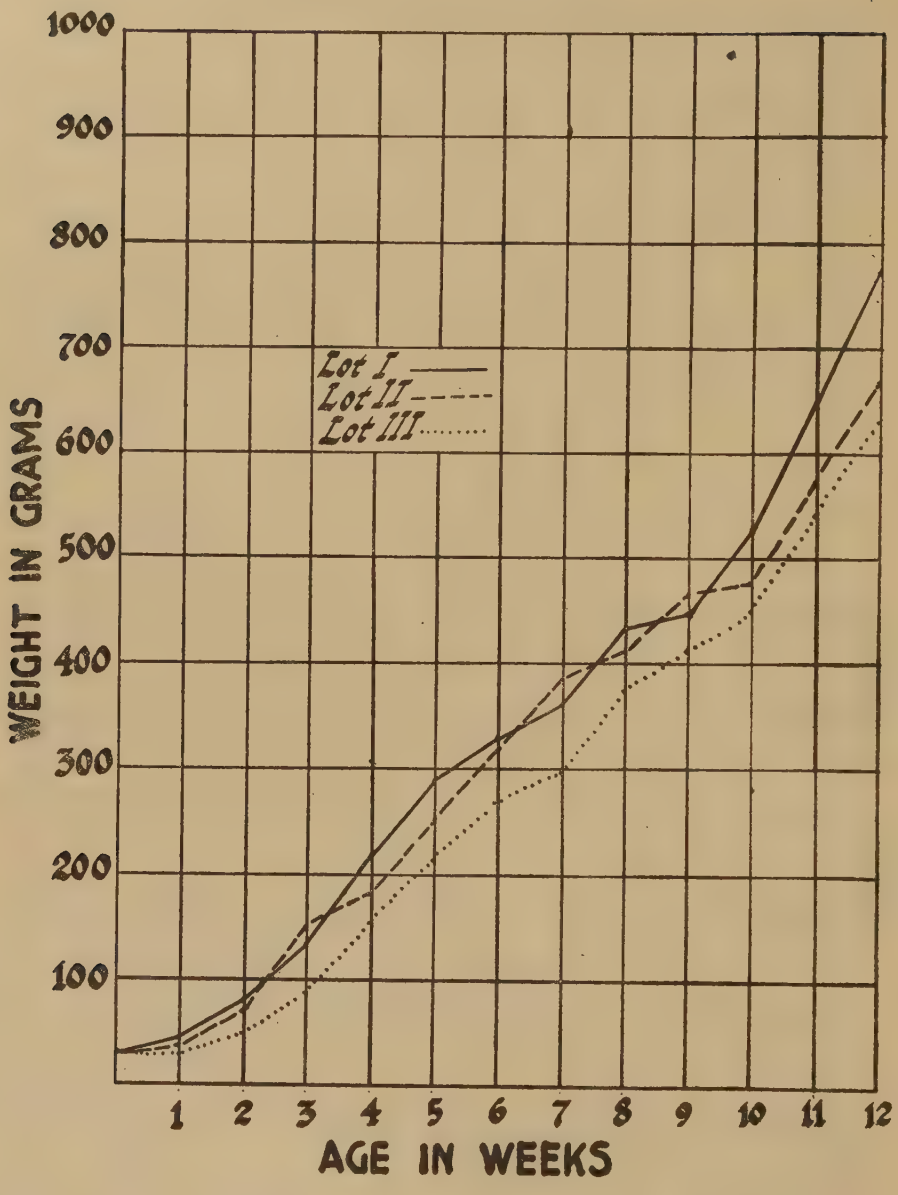

Fig. 3.—Average rates of growth of chicks in the first trial.

In trial 2, a somewhat different trend in the rate of growth was observed (fig. 4). Lot III outgrew lots I and II during the first three weeks and outweighed lot I on the ninth week. Lot II consistently

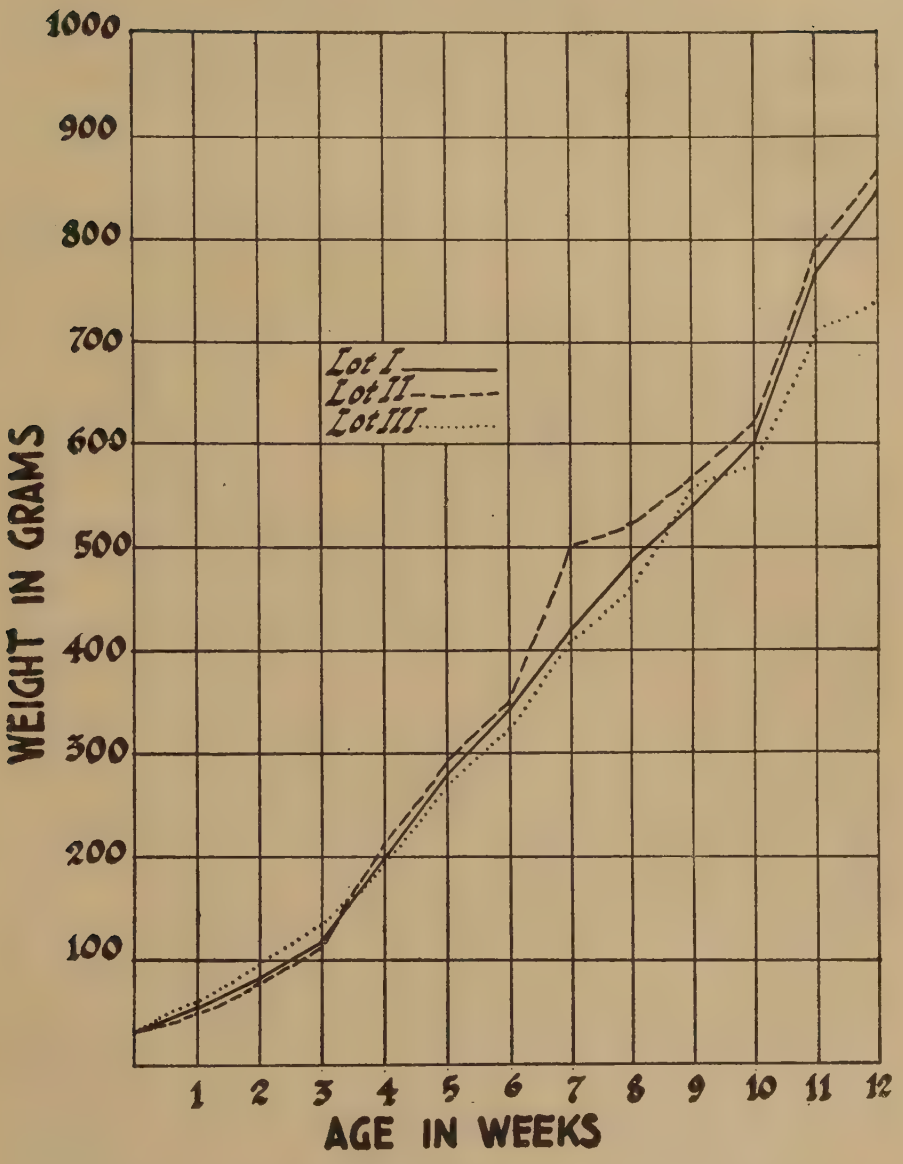

Fig. 4.—Average rates of growth of chicks in the second trial.

registered a higher average weight than lots I and II from the fourth to the twelfth week.

In trial 3, a more uniform rate of growth was shown by the birds in the three lots (fig. 5). Except in the fourth and fifth weeks, lot I birds were consistently heavier than birds in lots II and III, with

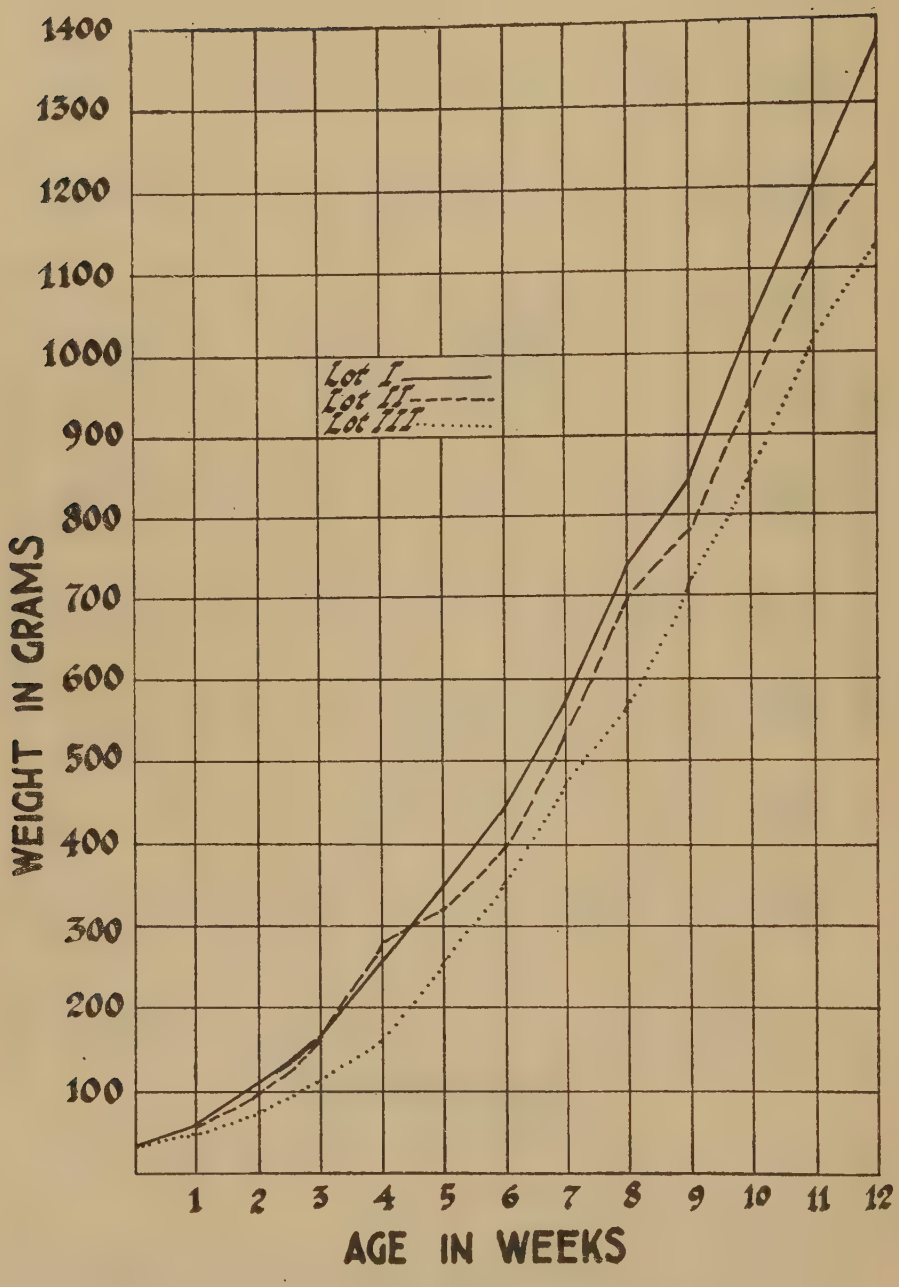

Fig. 5.—Average rates of growth of chicks in the third trial.

lot III consistently showing the lowest average weights. The final weighing showed that lot I had an advantage of 115.8 grams over lot II and 233.6 grams over lot III.

Exceptionally heavy weanlings were produced in trial 3 perhaps because the chicks used in this trial came from better stock. On the other hand, the birds in trial 1 showed low average weights because they were raised from April to June, the hot months of the year. Yadao (1936) reported that the April hatch has the highest percentage of mortality and the lowest rate of growth.

As far as the effect on the rate of growth is concerned, the results obtained in this study seem to indicate that in the absence of "Cono" fine rice bran, "Kiskis" rice bran passed through a 1-millimeter sieve can be satisfactorily used as a substitute in the ration for growing chicks from the time they are hatched until they reach weaning age.

Feed consumption and cost. The amount of feed consumed (table 2) indicates that the two grades of sieved "Kiskis" rice bran used in the rations for lots II and III were as well relished by chicks as the "Cono" rice bran. Given the same length of time, chicks in lots II and III consumed their feed at a faster rate than the chicks in lot I, probably because the coarser rice bran particles in the rations of lots II and III were easier to peck than the fine particles in the ration given to lot I. However, in the conversion of feed consumed to gain in weight, lot I was considered the most efficient, lot II next, and lot III the least efficient.

Inasmuch as poultrymen are more interested in actual returns than in mere efficiency in utilizing feed, the cost of producing a unit gain in weight in terms of cost of feed becomes of great value in determining the better ration. In spite of the high cost of the ration given to lot I, it still cost less to feed this lot to produce a kilogram gain than the other lots. The same was true of lot II when compared with lot III.

When the actual returns above feed cost were computed, lot I showed the highest average returns, lot II the next highest, and lot III the lowest. The figures indicate that it would still pay to use either of the two grades of "Kiskis" rice bran in rations for growing chicks although both grades are not as profitable as the "Cono" fine rice bran. The finer "Kiskis" rice bran is preferred to the coarser "Kiskis" rice bran for feeding young chicks.

Mortality. The highest over-all mortality occurred in lot III and the lowest in lot I (table 3). The rate of mortality in lot III was consistently the highest throughout the three trials, whereas those in lots I and II were practically the same. When the three trials were compared, the mortality was lowest in the third trial and highest in the first trial. The mortality in trial 2 was midway between the two, except for lot III which had the same mortality in trials 2 and 3.

The very low mortality ratio in the third trial is again attributed to the kind of chicks used.

Most of the deaths in all the lots during the three trials were due to coccidiosis,[3] which affected the chicks as early as the second week, and to roup, which broke out from the eighth to the twelfth week. Mortality rates in the three trials were lower than those reported by Garcia and Fronda (1951) and Baclig and Fronda (1949).

Other observations. About fifty per cent of the weanlings in lots II and III had light-colored plumage (fig. 1), lot III birds being lighter than lot II birds. The change in feather pigmentation, however, was not observed in the last trial.

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[3] As determined by Dr. Faustino Mensalvas, of the Department of Animal Husbandry.

TABLE 1

Average weekly weights and number of New Hampshire chicks in the three trials

AGE	LOT I		LOT II		LOT III	
	No. of birds	Weight	No. of birds	Weight	No. of birds	Weight
		grams		*grams*		*grams*
1 day	90	39.9	90	40.5	90	40.5
1 week	90	54.8	88	53.4	89	53.2
2 weeks	89	87.8	85	81.7	86	75.4
3 weeks	89	139.6	82	141.8	82	110.7
4 weeks	88	220.7	81	205.2	80	176.3
5 weeks	88	297.8	81	295.6	79	249.0
6 weeks	88	371.4	81	363.1	79	325.0
7 weeks	85	453.6	81	478.7	79	414.4
8 weeks	81	552.2	80	557.1	79	475.6
9 weeks	80	637.5	78	617.2	77	571.8
10 weeks	79	744.6	76	706.6	74	645.2
11 weeks	76	887.1	74	848.9	72	781.1
12 weeks	76	1022.8 ± 37.0	74	955.4 ± 34.6	70	862.2 ± 31.4

TABLE 2

Amount and cost of feed consumed and returns above feed cost

ITEM	LOT I				LOT II				LOT III			
	Trial			Average [c]	Trial			Average [c]	Trial			Average [c]
	1	2	3		1	2	3		1	2	3	
Total amount of feed consumed, kilograms	79.8	92.9	126.5	99.73	80.8	110.7	137.9	109.80	83.8	117.5	123.5	108.27
Total cost of feed consumed, pesos [a]	23.94	27.87	37.95	29.92	21.82	29.89	37.23	29.65	20.11	28.20	29.64	25.98
Total gain in weight of birds at 12 weeks of age, kilograms	14.31	21.81	38.02	24.71	12.44	21.24	33.38	22.49	10.69	18.19	27.83	18.90
Amount of feed consumed to produce a kilogram gain at 12 weeks of age, kilograms	5.58	4.26	3.33	4.04	6.49	5.21	4.13	4.88	7.84	6.46	4.44	5.73
Cost of feed to produce a kilogram gain, pesos	1.67	1.28	1.00	1.21	1.75	1.41	34.84	1.32	1.88	1.55	1.07	1.38
Weanlings produced, kilograms	15.44	22.85	39.44	25.91	13.57	22.30	1.12	23.57	11.82	19.25	29.29	20.12
Returns from sale of weanlings, pesos [b]	38.60	57.13	98.60	64.78	33.93	55.75	87.10	58.93	29.55	48.13	73.23	50.30
Actual returns above feed cost, pesos	14.66	29.26	60.65	34.86	12.11	25.86	49.87	29.28	9.44	19.93	43.59	24.32
Returns above feed cost based on 100 weanlings, pesos	73.30	108.37	209.14	139.44	60.55	99.46	178.11	118.73	52.44	76.65	167.65	104.24

[a] Cost of a kilogram feed for lot I, ₱0.30; for lot II, ₱0.27; for lot III, ₱0.24.
[b] Cost of a kilogram live weight, ₱2.50.
[c] Based on the three trials.

TABLE 3

Percentage of mortality

ITEM	LOT I				LOT II				LOT III			
	Trial			Total	Trial			Total	Trial			Total
	1	2	3		1	2	3		1	2	3	
Number of chicks at start	30	30	30	90	30	30	30	90	30	30	30	90
Number of weanlings after 12 weeks	20	27	29	76	20	26	28	74	18	26	26	70
Number of chicks that died ..	10	3	1	14	10	4	2	16	12	4	4	20
Percentage of mortality	33.3	10.0	3.3	15.6	33.3	13.3	6.7	17.8	40.0	13.3	13.3	22.2

MARKETING OF FARM PRODUCTS PRODUCED IN BANTAYAN, CEBU[1]

MARGARITA P. BAWAGAN

Four major classes of farm products were sold in 13 different combinations by the 200 farmers surveyed. Corn was included in eight combination groups, livestock and eggs in seven, coconuts and coconut products in seven, and other crop products in six. The average receipts from products sold were highest for farmers who sold coconuts and coconut products. The farm products were sold in small quantities as soon as they were available. No storage or warehousing facilities were used. The most common outlet for the products was the public market. Farm products were transported to the market place by passenger buses, bicycles, pack animals, carts, or manpower, depending upon the distance to be traveled and the nature and quantities of the products transported. Water transportation was used to take products to places outside Bantayan.

Corn was generally marketed green, shelled, ground, or in all three forms. Coconuts were sold by 13 farmers, toddy by 55, and copra by only two. Chickens and pigs were sold mostly to traveling buyers at prices varying with the size of the animal. Eggs were marketed weekly by 28 farmers at an average price of eight centavos apiece. The receipts from the sales of other crop products provided supplementary income to the farmers.

Bantayan is a small island lying north of Cebu. Its principal industry is fishing, but the inhabitants also raise many kinds of farm products. The most important of these are corn, coconut, copra, toddy or *tuba*, chickens and eggs, and pigs. An understanding of the marketing of these commodities would be valuable not only in helping the farmers get good returns but also in improving the distribution of farm products in the locality.

Tablante[2] remarked that marketing problems are not similar for all farmers, much less for all kinds of products. Farmers should, therefore, plan their marketing operations according to the individual needs of their farms.

Bevan[3] stated that the farmer has some choice in the matter of selling immediately after harvest or storing for later sale, selling to a local or a distant market, and deciding whether his market outlet shall be a country buyer, a commission firm, a farmer's cooperative, or, if he is favorably situated, the consumer himself. Notwithstanding these possible markets, however, the farmer has little influence upon the prices he may expect for his products.

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[1] Central Experiment Station Contribution No. 1705. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Agricultural Economics under the direction of Assistant Professor Nathaniel B. Tablante.

[2] N. B. Tablante, *Agric. and Indus. Life*, [9] 13, 12 (1951).

[3] L. A. Bevan, "Economics of Marketing. A Practical Guide to Successful Farming," Garden City Publishing Co., Inc., New York, 1943, pp. 867–898.

Mabbun [4] reported that copra and nuts pass through the hands of from one to four middlemen in moving from the farm to the exporter. This increases the cost of marketing and thereby decreases the farmer's share of the consumer's peso because each of these middlemen must be paid, and the payment comes out of the final selling price, or the consumer's buying price.

The present work was undertaken from December, 1951, to January, 1953, to study the methods used by farmers in marketing corn, coconuts, toddy, chickens, eggs, and pigs in the island of Bantayan, Cebu, and to understand the problems of the farmers concerning the movement of products from their farms to the consumers.

METHOD OF STUDY

A field survey was conducted in the three municipalities of Bantayan, Madridejos, and Santa Fe in the island of Bantayan, Cebu, in December, 1951, and during the summer of 1952. Twenty barrios from the three towns were selected on the basis of number of farmers in each barrio who sold their products. Two hundred farmers were interviewed. Information about the practices followed in selling the products, channels of dispersion involved, quantities of different products sold, prices, and other pertinent data were obtained from the farmer-informants with the use of a questionnaire schedule. Twenty-three middlemen (buyers and retailers) and a number of consumers were also interviewed to supplement the data supplied by the farmers.

DISCUSSION OF FINDINGS

Farm products marketed and average receipts from sales. Four major kinds of products (table 1) were marketed: corn; livestock (chickens, pigs) and eggs; coconuts and coconut products (copra, toddy); and other crop products (mungo, peanuts, cassava, mandarin orange, atis, sweet potato, bananas, siniguelas, and jakfruit). These products were sold in 13 different combinations. Corn was included in eight group combinations, livestock and eggs in seven, coconuts and coconut products in seven, and other crop products in six. There were really four separate combinations under the miscellaneous group: livestock and eggs only; corn, coconuts, coconut products, and other crop products; all the different kinds; and coconuts, coconut products, and other crop products.

Farmers who sold coconuts and coconut products obtained the highest average receipts (table 1). Product combinations which included coconuts and coconut products also gave high average receipts from sales. It may be noted that the average total receipts derived by a farmer from the sale of farm products were quite low. This may be explained by the fact that fishing is the principal occupation

[4] Pablo N. Mabbun, *Philippine Agriculturist*, 19, 283 (1930).

in this area, and farming is only supplementary. Tenants commonly gave one-third of the receipts from corn to the landlord.

Market outlets and facilities. The products were sold even in small quantities as soon as they were available. No storage or warehousing facilities were observed being used in the movement of the products through the different channels of dispersion. The products were sold right on the farm, at the public market, or in other places outside of Bantayan Island, such as Kawit or Bacolod City. They were bought by the consumers themselves, traveling buyers, retailers, dealers, or merchants, who were the farmer's creditors and to whom the farmers had pledged to deliver their products.

Most of the corn, toddy, copra, and eggs were sold by the farmers to retailers; coconuts, pigs, and chickens were sold to traveling buyers, creditors, or other middlemen. The other crop products were mostly bought on the farm by the consumers. More farmers also sold their coconuts and livestock on the farm, but these products were sold to buyers other than consumers. The public market was the most common outlet for the products.

For transporting their produce from the farm to the market place, farmers used passenger buses, bicycles, pack animals, carts, or manpower depending upon the distance to be traveled and the nature and quantities of the products transported. Bicycles were commonly used for bringing the toddy containers to town. Those who sold to places outside Bantayan also made use of water transportation to market their products.

Marketing of corn. Balmaceda [5] observed that corn growers do not receive the benefits of open competitive buying and generally fail to get the price that their products warrant because, with their small harvest and their pressing need for immediate cash, they have no recourse but to sell, soon after harvest, to the nearest buyers in their localities. Such a situation prevails among the farmers selling corn in the island of Bantayan.

Corn is generally marketed green, shelled, ground, or in all three forms (table 2). Raw green corn is sold to retailers who come to the farm, and these retailers, in turn, boil the corn ears and sell them in the public market. Some farmers boil the corn and sell them in the market themselves.

Of the average total production of 40 cavans of shelled corn to a farm a year, only 17.75 cavans, or about 45 per cent, were marketed at an average price of ₱11.36 a cavan (table 2). The rest were used for food by the farmer's household.

The farmers reported that they got about three gantas of corn bran and about one ganta of *binlod* (chipped particles of grain) from every cavan of shelled corn milled. At 25 centavos a ganta,

[5] Cornelio Balmaceda, *Agric. and Indus. Life*, [4] 12, 6 (1950).

these by-products would have a value of ₱14.81 if purchased from retailers. The farmer who milled his own corn, therefore, got this extra amount.

Of the price paid by the consumers for riced corn and its by-products, about seven per cent was received by the farmer and about twenty-three per cent by the middlemen. The total middlemen's margins for a cavan of corn averaged ₱3.45. The farmers and middlemen reported husking and shelling expenses of ₱1.00 a cavan, milling expenses of ₱1.00, and transportation expenses of ₱0.20. These three common market expenses amounted to about fifteen per cent of the price paid by consumers.

Marketing of coconuts and coconut products. The average quantities of coconuts and coconut products marketed and the average prices received for them are shown in table 2.

Coconuts are usually harvested three or four times a year, ordinarily during August or September, December, and March, April or May. The unhusked nuts are sold right on the farm as soon as the buyers arrive. The expense of picking and piling the nuts is borne by the farmer.

The copra produced by two farmers was sun-dried and was marketed only once a year. Some of the expenses incurred by these farmers in selling copra were for gathering the nuts (₱0.40 a hundred), splitting the nuts and removing the meat (₱1.00 a hundred), and transportation (varying according to distance). The two copra producers could get an average of 30 to 35 kilos of copra from 100 nuts.

The average yield of 546.49 liters of toddy to a tree reported by the farmers was more than twice as much as the 208 liters reported for the province of Laguna in 1909 by Copeland.[6] A system of sharing was commonly followed. The owner of the trees who furnished all the equipment and containers got the toddy gathered for three days in a week; the toddy gatherer got the production for the remaining four days of the week.

In selling toddy the unit of measure commonly used was the *kunding,* which is equivalent to 7.57 liters (two gallons). The bamboo container holding this capacity is known as the *kundingan.* The toddy was brought to market in these *kundingans* on bicycles, on passenger buses, on horseback, on cattle's back, or even on the backs of the men themselves. Farmers who lived in remote barrios had to sell their toddy in the immediate locality, although they could get more in the public market. The retailers in the public market served as assembly point for the toddy produced by different farmers. Small retail store owners and some consumers bought their toddy from this assembly point.

[6] E. B. Copeland, "The Coconut," MacMillan and Co., Limited, London, Great Britain, 1931, pp. 192–193.

From those who sold their toddy to the retailers in the market place of the town, a seller's fee of ₱1.00 was collected every four months by the municipal treasurer. Toddy sellers who used bicycles for transporting the product to town had to pay ₱2.20 every four months for their bicycle license. *Tangal,* which is the bark of *Ceriops tagal* (Perr.) C. B. Rob., was used as coloring material. A bundle of *tangal,* which ordinarily cost ₱0.20, could be used to color the toddy gathered for a week amounting to 105.98 to 113.55 liters (28 to 30 gallons). Toddy gatherers who got cash advances from the owners or from the retailers were obliged to deliver their toddy to those creditors. Toddy was gathered and sold daily.

Marketing of chickens and eggs. Chickens and eggs were marketed only occasionally. The more common market outlets for these products were restaurant owners, traveling buyers who also bought copra, pigs, and other products, retailers in the public market, retailers who owned variety stores, and consumers.

Chickens were sold according to size, the bigger ones being designated as first class and sold at ₱1.50 to ₱2.00 each. The smaller ones were classified into lower classes and sold at ₱1.00 to ₱1.20 each. When the birds were sold in large numbers, the unit of sale was the dozen. The average price for a dozen of all sizes was ₱15.67 (table 2).

Eggs were marketed weekly at ₱0.15 for two, ₱0.25 for three, and ₱0.10 each, or an average of ₱0.08 each (table 2). Some retailers who went to the farms could get eggs for as low as ₱0.05 each. They would go from farm to farm buying all the eggs that were available and then sell them at higher prices in their stores.

Marketing of pigs. Pigs were also sold occasionally depending upon the need for cash and the availability of buyers (table 2). Most of the animals marketed were for meat or slaughter purposes and were priced according to size. These pigs weighed 50 kilos or more. Weanling pigs were also bought by neighboring farmers to be fattened and sold for slaughter later.

Marketing of other farm products. Some of the farmers surveyed sold their minor products like mungo, peanuts, cassava, camote, atis, mandarin orange, bananas, siniguelas, and jakfruit (table 2). Sweet potato, cassava, and bananas were used as substitutes for riced corn and as payments to laborers instead of cash. The other fruits were sold to retailers in the public market and were additional sources of cash, although they contributed only a very small proportion to the farmer's total income. Some farmers, especially those who lived in remote barrios, bartered their cassava and sweet potato for fish, salt, or toddy.

CONCLUSIONS

1. The findings of this study reveal that the marketing of farm products commonly produced by the farmers in the island of Bantayan, Cebu, is haphazard and crude. The quantities of marketable

commodities are small so that they are difficult to handle economically and efficiently and cannot provide adequate income to the producers. The small volume of marketing also tends to make the farmers pay very little attention to improving their marketing system.

2. No storage or warehousing facilities are used. This may be due to the fact that the small volume of production and marketing does not warrant the putting up of such facilities.

3. Farmers are often forced to sell at lower prices to merchants or dealers who have advanced them some money. This shows that the farmers need adequate credit facilities.

4. Farm products are sold ungraded. There are no existing standards or grades by which the farmers can classify their products, and there appears to be little incentive for performing this important marketing function.

TABLE 1

Number of farmers selling different kinds of farm products in Bantayan, Cebu, 1951–1952, and average annual receipts

PRODUCTS SOLD	NUMBER OF FARMERS REPORTING	PERCENTAGE OF TOTAL	TOTAL RECEIPTS ALL FARMERS REPORTING	AVERAGE RECEIPTS EACH FARMER
			pesos	*pesos*
Corn, livestock,[a] eggs	67	33.5	20,972.44	313.02
Coconuts, copra, toddy	40	20.0	35,480.29	887.01
Corn	37	18.5	10,440.95	282.19
Corn, other crop products[b]	27	13.5	7,289.93	269.99
Corn, coconuts, copra, toddy	6	3.0	3,751.96	625.33
Coconuts, copra, toddy, other crop products	6	3.0	2,283.54	380.59
Corn, livestock, eggs, coconuts, copra, toddy	5	2.5	2,946.99	589.40
Corn, livestock, eggs, other crop products	4	2.0	768.57	192.14
Livestock, eggs, coconuts, copra, toddy	4	2.0	2,558.59	639.65
Miscellaneous groups	4	2.0	2,240.53	560.13
Total	200	100.0	88,733.79	443.66

[a] Livestock refers to chickens and pigs.

[b] Other crop products include mungo, peanuts, cassava, mandarin orange, atis, sweet potato, bananas, siniguelas, and jakfruit.

TABLE 2

Average quantities marketed and average prices received by 200 farmers for different products sold in Bantayan, Cebu, 1951–1952

COMMODITY	UNIT OF SALE	NUMBER OF FARMERS	QUANTITY PRODUCED		QUANTITY MARKETED		AVERAGE PRICE	AVERAGE RECEIPT
			Total	Average	Total	Average		
							pesos	*pesos*
Corn:								
Shelled	cavan	144	5,715.50	39.68	2,556.20	17.75	11.36	201.64
Ground	cavan	4	111.00	27.5	59.00	14.75	13.81	203.69
Green	hundred ears	13	626.00	48.15	626.00	48.15	1.25	60.19
Coconuts and coconut products:								
Nuts	hundred nuts	13	610.25	46.94	593.00	6,489.79	3.54	161.49
Toddy	liter	55	422,439.91	2,024.73	376,437.93	45.62	0.11	709.48
Copra	kilo	2	1,380	690.00	1,380.00	690.00	0.26	179.40
Livestock and eggs:								
Pigs	each	32	78.00	2.32	72.00	2.21	42.62	94.19
Chickens	dozen	71	267.10	3.76	201.6	2.84	15.67	44.50
Eggs	each	28	45,162.00	1,613.00	41,678.00	1,481.00	0.08	118.48
Other crop products:								
Mango	cavan	16	127.50	7.97	121.00	7.56	24.25	183.33
Peanuts	cavan	11	106.00	9.64	88.00	8.00	9.00	72.00
Cassava	can	19	536.60	28.24	536.60	28.24	1.22	34.45
Camote	can	5	82.04	14.61	82.04	14.61	1.38	20.16
Atis	hundred pieces	8	116.78	14.59	116.78	14.59	1.43	20.86
Mandarin orange	hundred pieces	1	59.55	59.55	54.55	54.55	2.20	120.01
Bananas	hundred pieces	12	981.30	81.78	981.30	81.78	0.78	63.79
Sineguelas	hundred pieces	2	33.32	16.66	33.32	16.66	0.90	14.99
Jakfruit	each	1	19.00	19.00	14.00	14.00	1.45	20.30

NOTE ON THE OCCURRENCE OF THE MOSAIC DISEASE IN THE ABACÁ EXPERIMENT STATION IN BANAO, GUINOBATAN, ALBAY [1]

G. O. Ocfemia

WITH TWO TEXT FIGURES

On June 23, 1951, seven leaves of abacá plants (*Musa textilis* Neé) were submitted to the writer by Dr. Donald De Leon, coconut specialist in charge of the work on cadang-cadang disease of coconut at the Abacá Experiment Station in Banao, Guinobatan, Albay. According to Dr. De Leon, the four leaves which had the mosaic symptoms were noted by him on a young abacá plant in the station on June 19 while he was out collecting insects.

At the writer's request, Dr. De Leon sent to Los Baños for experimental use four apparently diseased and two apparently healthy plants from another section of the Abacá Experiment Station. Of these six plants only one of the apparently healthy specimens survived infestation by the root weevil *Cosmopolites sordidus* Germar. The specimens received from Guinobatan were typical cases of the abacá mosaic (fig. 1, left) and differed from the hereditary leaf streaks which occur on abacá, banana, and wild congeners. As a precaution against the establishment and spread of the disease in Guinobatan and vicinity, the writer recommended that the plants from which the specimens had been taken be destroyed completely at once.

Alarmed by the writer's determination of the disease, the Bureau of Plant Industry informed Dr. Otto A. Reinking, Foreign Agricultural Adviser of the Philippine Government and in charge of the abacá mosaic control campaign in Mindanao. Before going to the field for inspection, Dr. Reinking came to Los Baños on August 30, 1951, for consultation with the writer regarding the specimens received from Dr. De Leon and which had been determined as abacá mosaic. In his report to the Secretary of Agriculture and Natural Resources on September 24, 1951, after surveying the abacá areas in Guinobatan and studying abacá plants from Sañgay, Camarines Sur, which had been collected by Dr. T. G. Fajardo from the nursery on San Miguel Island, Tabaco, Albay, Dr. Reinking concluded that the disease identified by the writer was definitely not mosaic. Dr. Reinking also stated that the pathologists of the Bureau of Plant Industry had failed to transmit to healthy abacá plants the virus from the suspected abacá plants collected from Guinobatan.

On June 17, 1952, while visiting the experiments on cadang-cadang disease of coconut in the Guinobatan Abacá Experiment Sta-

[1] Central Experiment Station Contribution No. 1706.

Fig. 1.—The nether surfaces of two leaves of abacá plants infected with mosaic. The symptom shown in the left figure was evidenced by the specimen sent to us by Dr. Donald de Leon on June 23, 1951, from the Abacá Experiment Station in Banao, Guinobatan, Albay. The right figure has very numerous, small, elongated streaks which will soon turn rust brown, and the green parts of the blade have a purplish tinge which is noticeable on the upper surface of the leaf. This was the symptom of the abacá mosaic which Dr. De Leon showed to the writer on June 17, 1952, in the Abacá Experiment Station. (*Photograph by Photographic Division, College of Agriculture.*)

tion in Banao, the writer was taken by Dr. De Leon to the site of an abacá plant which had a pseudostem hardly a meter long. This plant exhibited rust-brown streaks on the leaves and a purplish tinge on the

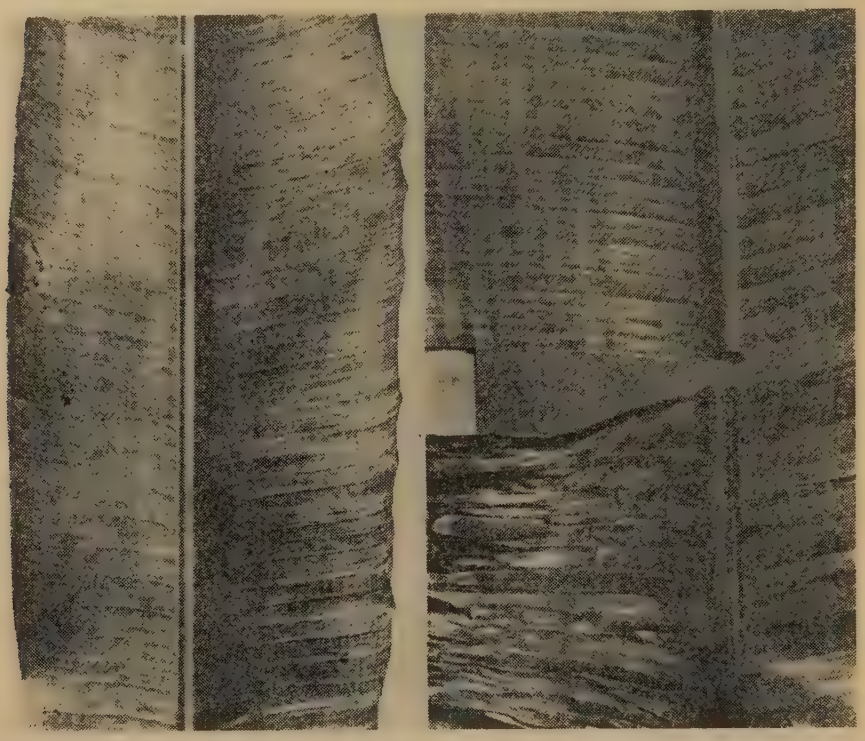

Fig. 2.—Left, the upper surface of the leaf of an abacá plant infected with mosaic with symptom like that of the right figure in figure 1. The leaf has very numerous minute, indistinct, amber-brown streaks which give the entire upper surface a purplish tinge. The younger leaves of the infected plant have spindle-shaped yellow areas with borders which will soon turn amber brown. The colors are more distinct on the upper than on the lower surface. Right upper figure, on the nether surface of the leaf, the spindle-shaped streaks lengthen rapidly in the direction of the veins; they start from the midrib and end at the margin. The midrib also shows the purplish-brown streaks. The right lower figure shows the nether surface of the leaf in the more advanced stage of this type of abacá mosaic. The large purplish-brown streaks on the midrib are now very prominent and extend from the leaf sheath to the tip of the midrib. By lateral coalescence the streaks on the lamina will cover large areas and become irregular in shape. The centers of the streaks will dry up and become almost tawny olive on the upper surface and snuff brown on the lower surface. (*Photograph by Photographic Division, College of Agriculture.*)

rest of the upper surface of the lamina (fig. 1, right, and fig. 2) and purplish-brown streaks on the nether surface of the petioles and leaf sheaths. This mosaic symptom had been noted in transmission ex-

periments at Los Baños. For this reason the writer suggested that the plants be destroyed completely at once and the neighboring stools watched with suspicion.

The danger of spread is greater in mosaic than in bunchy-top. Mosaic can be spread to nearby abacá plants and other cultivated plants and weeds by vector aphids of which *Aphis gossypii* Glover, *A. maidis* Fitch, *Rhopalosiphum nymphaeae* (Linn.), and *R. prunifoliae* Fitch are definitely known. From the other hosts the virus can be transferred back to abacá. Abacá bunchy-top is more destructive to the host than the mosaic and may be regarded as a self-eliminating disease. Once abacá is infected with the disease, it never recovers. It gradually grows smaller and smaller until it disappears in about two years. The disease has only one aphid vector, *Pentalonia nigronervosa* Coq., though in experimental transmission *P. caladii* van der Goot, in the absence of its natural host, *Caladium bicolor* (Ait.) Vent., may be induced to transmit the virus.

Although a visit made on April 7, 1953, to the site of the specimen noted on June 17, 1952, did not reveal other cases of the disease, it can not now be said that the Guinobatan Abacá Experiment Station is free from mosaic disease. Constant vigilance is necessary in order to suppress sporadic outbreaks of the mosaic disease not only in the station but in other parts of Albay.

The other places where abacá mosaic is present are Leyte and Sorsogon. It is said that the disease was introduced in Sorsogon with planting materials brought from Mindanao without the knowledge of the quarantine people of the Abacá Campaign Headquarters in Davao.

CASE REPORT: NEWCASTLE DISEASE AMONG NATIVE CHICKENS IN THE UP COLLEGE OF AGRICULTURE [1]

FAUSTINO S. MENSALVAS AND GONZALO V. GARCIA

Newcastle disease or avian pest, which is caused by a virus, is a well-known disease in the poultry industry. Because of its high mortality toll among birds, some countries classify it as a notifiable disease.

This paper is a report on an avian pest outbreak among native chickens in the Department of Animal Husbandry, College of Agriculture, University of the Philippines.

History. On January 4, 1953, the Department of Animal Husbandry purchased 125 native chickens from Lipa City, Batangas, for experimental purposes. The flock consisted of a number of hens and pullets and two roosters. At the time they were bought, the birds appeared normal. They were housed in an isolated shed away from the main poultry buildings, in accordance with quarantine regulations.

Mortality. The day after the flock arrived one of the birds died. Six more died the following day. There was a sharp increase in the rate of mortality from the seventh to the twelfth day, inclusive, with 85 deaths recorded or an average mortality rate of 14 birds a day. After the twelfth day the death rate declined gradually until January 31, when the last death was recorded. Twenty-five birds succumbed to the disease from January 13 to January 31, inclusive, an average mortality rate of 1.32 birds a day. The total mortality rate was 93.60 per cent since only eight survived out of the 125 birds purchased.

Morbid anatomy. Signs of septicemia were part of the anatomical changes noted on autopsy. Externally, there was purplish discoloration of the comb, wattles, and unfeathered portions of the head. Internally, there were hemorrhages of the mucosa of the air passages which ranged in extent from the tiniest petechia to ecchymosis. In the lumen of these air passages was a mucoid exudate tinged with blood. This was most abundant in the trachea. The lungs and kidneys were found to be hyperemic. Coincident with these changes were hemorrhages of the mucosa of the proventriculus. These hemorrhages, however, were not as constant as those observed in the air passages.

Symptoms. A peculiar respiratory effort characterized the disease. At each inspiration, the affected bird would raise its head

[1] Central Experiment Station Contribution No. 1707.

and almost simultaneously open its beak, producing some gurgling sounds. Thick, gelatinous mucus or bloody exudate obstructing the posterior part of the buccal cavity was invariably observed when the beak was opened. The other symptoms were depression, inappetence, and cyanosis of the comb and wattles. Some ailing birds had diarrhea and the hue of their feces varied from milky white to greenish white. The highest body temperature recorded was 43.2°C.; it went down to as low as 36.9°C. when death was imminent. Nasal discharges were also noted, as well as puffy swelling of the infraorbital sinuses with accumulation of cheesy materials in the conjunctival sac in chronic cases. Affected birds tended to huddle close together or seek corners in the shed.

Treatment. Attempts at treatment were useless. Varying mixtures and concentrations of penicillin, dihydrostreptomycin, sulfonomides, iodine preparations, camphorated oil, quinine, and bicarbonates were given at regular intervals but proved ineffectual.

Remarks. Six of the eight birds which survived the early onset of the disease also died afterwards of avian pest. However, the symptoms produced by the disease in these six birds were milder, and the intervening periods between the recorded deaths were longer. The two remaining birds are a rooster and a hen.

COLLEGE AND ALUMNI NOTES

The JUSMAG staff visited the College on January 20, 1953. Colonel Eulogio Balao, commander of II Military Area, accompanied the guests.

Mr. Daniel M. Braddock, economic counsellor, US Embassy, was a campus visitor on January 5, 1953. With him were Dean Leland E. Call, of MSA, and Mr. Jack R. Johnston, agricultural attaché, US Embassy.

Other recent visitors were Messrs. Renato Delfino, Alfonso B. Castro, and Bienvenido E. Figueroa, of PHILCUSA. They came here on January 9, 1953, to inspect laboratory apparatus acquired through PHILCUSA-MSA.

Dean L. B. Uichanco was elected member of the board of directors of the PRUCIS at a meeting held January 10, 1953.

Miss Helen F. Fabian, clerk in the Administrative Division, passed the accounting clerk examination given by the Bureau of Civil Service on September 20, 1952.

Mr. Hugo B. Fernandez, '35, technical assistant in the Industrial Development Branch, PHILCUSA, arrived on December 22, 1952, from a four-month fellowship on alcohol manufacture granted by the United Nations. Mr. Fernandez spent two months in Sweden and one month in Finland.

Mr. Felix N. Salcedo, '36, will attend the University of Lexington in Kentucky as a trainee under the MSA-PHILCUSA technical assistance program.

Mr. Emilio F. Feliciano, '24, is with the Fiber Inspection Service in Davao.

Mr. Esteban Cada, '35, of the Bureau of Plant Industry, left for the United States. He will pursue advanced studies in plant genetics at Kansas State College.

Mr. Sotero Albano, Jr., '52, is connected with the Matutum Agricultural Development Corporation in Dadiangas, Cotabato.

Mr. Clemente P. Juliano, Jr., '49, instructor in agricultural engineering, was awarded by the Australian legation a fellowship in mechanical farming of small grains, with special reference to rice. He left by plane for Australia last January 20, 1953.

The entire technical staff of the Division of Soil Conservation Surveys, Bureau of Soil Conservation, DANR, led by Isidoro A. Romero, '41, acting chief of division, visited and studied soil series and soil types established in Laguna, Rizal, Cavite, Batangas, and Quezon.

Mr. Isidro S. Domingo, '51, is at present with the La Granja Experiment Station, La Carlota, Negros Occidental.

Dr. Francisco O. Santos, assistant dean of the College of Agriculture and assistant director of the Central Experiment Station, returned on February 4, 1953, from a four and a half months' visit to Europe and the United States under the MSA-PHILCUSA training program. He studied organization and administration of agricultural experiment stations in the United States and conferred with nutritionists and chemists working on utilization of agricultural wastes. He also made a study of schools of home economics and observed laboratory programs in nutrition.

Mr. Gerald E. Tichenor and Mr. Charles Wolf, Jr., both of the Department of State in Washington, D.C., visited the College on January 23, 1953. Mr. Tichenor is in charge of the "Burma" desk, and Mr. Wolf, of the "South Asia" desk in Washington. The visitors were accompanied by Dean Leland E. Call.

Mrs. Edna May Martin, San Diego, California, of the Federation of Women's Club, was a campus visitor on January 20, 1953. With her was Mr. James P. Emerson, assistant chief of the agricultural division, MSA.

A paper on *Melanconium* fruit rot of the tomato, by Dr. Faustino T. Orillo and Buenaventura B. Bombay, was read and discussed at a regular scientific meeting of the Los Baños Biological Club held on January 30, 1953, at the Chemistry Lecture Hall.

The Philippine Country Life Association had its annual "Pista sa Nayon" dance at the Seniors' Social Garden on January 24, 1953. The initiation of new members, a vocal solo by Benjamin Calayag, a Hawaiian dance by RHS girls, a Tagalog poem by Demetrio Baque, a Benguet dance, and an instrumental selection were among the numbers in the intermission program. Romualdo P. Lapis is the president of the association; Dr. F. M. Sacay, the adviser.

The UP Beta Sigma Fraternity, Los Baños Chapter, held a rally on January 30, 1953. The affair featured a torch parade from the College gate to the Triangle Field, a bonfire, a short talk by Dr. Charles A. Bratton on the theme "Off to the Farm to Disseminate Brotherhood," decoration of the top Betans of the year 1952-53, musical numbers by selected Betans, and a movie. The president of the fraternity is Onofre Griño; the adviser, Mr. Amado C. Campos.

Mom Chao Chakrabandhu, '37, was guest speaker at a special convocation held on January 22, 1953, at the Chemistry Lecture Hall. Prince Chakrabandhu is now vice rector of Kasetsart University, Thailand, of which Mr. Thongdee Resananda, '24, is the rector. Prince Chakrabandhu is visiting various countries of the world to study the organization and administration of agricultural colleges. His trip is under the MSA program in his country. He was introduced at the convocation by Dean L. B. Uichanco.

Mr. Victoriano A. Gaborno, '42, government pensionado, is specializing in rice and corn culture at the Louisiana State University in Baton Rouge. Before he left, he was teaching at the CLAC. Being

president of the alumni association of that college, he is a member of its Board of Regents.

Mr. Mariano E. Gutierrez, '17, gave a talk on the methods of breeding tobacco during the laboratory period of the class in Advanced Plant Breeding under Dr. Herbert K. Hayes. Mr. Gutierrez made a thorough and interesting explanation of the past and present breeding programs of his division in the Bureau of Plant Industry. Another off-campus visitor who took part in the discussion was Dr. Juan P. Torres, '19, of the Los Baños Economic Garden.

Several alumni took active part in the convention of the Philippine Society of Agricultural Engineers last February 6 and 7, 1953. Among those who participated in the program were Alejandro B. Catambay, '24, Alexander Gordon, '23, Ignacio R. Ang, '32, Jesus P. Mamisao, '30, Severo N. Capistrano, '15, Pedro N. Laudencia, 49, Felipe A. Maclang, '41, Ramon V. Manio, '18, Ernesto L. Rigor, '36, Anastacio L. Teodoro, '18, and Guillermo P. Santos, '48. Other alumni served in various committees.

Dean William I. Myers, of the New York State College of Agriculture, Cornell University, and Mrs. Myers were visitors of this College from February 15 to February 20, 1953. Dean Myers was the guest of honor at a special convocation held on February 19 under the auspices of the Student Body Organization. He talked on the progress of land grant colleges in the United States and stressed the importance of stepping up food production. A chorus of the Cornell hymn, "Far Above Cayuga's Waters," was rendered by selected students. Dean and Mrs. Myers and the other distinguished visitors, Mr. and Mrs. John Rockefeller III and Dean and Mrs. Leland E. Call, of the MSA, were introduced by Dean L. B. Uichanco. A buffet luncheon was served by the SBO at the Molawin Mess Hall.

A pansit-puto party was given in honor of Dean and Mrs. Myers by the College of Agriculture personnel at 4:00 o'clock P.M. of the same day. A vocal selection was rendered by Mr. Gerardo Baes of the administrative division and native folk dances, *Areuana, Tinikling,* and *Pandanggo sa Ilaw,* were presented by selected members of the junior faculty.

The Society for the Advancement of Research had its eighteenth initiation exercises on February 17, 1953, at the Chemistry Lecture Hall. The new members initiated were Alfredo Eloja, '53, and Ibarra Santos, '53, associate members; Dr. Herbert B. Hayes and Dr. George C. Kent, active members. Dr. Valeriano C. Calma, outgoing president of the Society, formally inducted into office the following newly elected officers: Dr. E. P. Baltazar, president; Dr. T. G. Fajardo, vice-president; Dr. J. R. Velasco, secretary; and Dr. F. T. Orillo, treasurer. An address was given by Dean William I. Myers, the guest of honor.

Mr. Haldore Hanson, TCA, Department of State, Washington, visited the College on February 6, 1953. He was accompanied by Dean Leland E. Call.

Mr. Reynaldo G. Marquez, a former student of this College, now in Australia under a joint British Commonwealth and UNESCO scholarship, is making good in his studies at the Sydney University according to a radio broadcast by the Australian Broadcasting Commision. Mr. Marquez was a Madrigal scholar while in this College. He was recommended by the Dean when the Australian government was looking for deserving candidates. In a letter sent to the Dean on February 7, 1953, Miss Helen G. Marquez expressed her thanks for the assistance given to her brother.

The annual Junior-Senior ball was held at the Seniors' Social Garden on January 31, 1952. Marcos Vega, Jr., is the president of the Junior Class; Lino Nazareno, of the Senior Class. Professor Nathaniel B. Tablante is the adviser of both organizations.

Mr. Amado C. Garcia, '51, is junior agronomist of the Bureau of Plant Industry. He is with the Fiber Division in Manila.

Mr. Eduardo C. Lecciones, '40, is at present a junior fertilizer supervisor of Negros Oriental. He was formerly assistant agricultural supervisor of the province.

Dean L. B. Uichanco, '15, was reelected president of the Laguna Council, Boy Scouts of the Philippines, at a meeting held on February 18, 1933.

Mr. Roman C. Nicdao, '51, is farm manager of a big farm in Maramag, Bukidnon. He supervises mechanized rice production.

Mr. Jesus Tale, '41, is the assistant provincial agriculturist of Negros Oriental.

Dr. M. L. Wilson, retired director of the extension service, USDA, and Mrs. Wilson visited the College on March 7, 1953. They were accompanied by Dean Leland E. Call.

Nai Chakr Jotisalicara, Vice-Dean of the Faculty of Agriculture, Kasetsart University, Bangken, Bangkok, Thailand, was a recent campus visitor. Vice-Dean Jotisalicara was awarded a training grant by the MSA of Thailand and has already visited various places in Europe, United States, Puerto Rico, and Hawaii. He is interested principally in horticulture.

Mr. Malcolm C. Gaar, of MSA, Saigon, Vietnam, and Mr. Winthrop A. Travell, controller, MSA, Manila, were College visitors on March 3, 1953. Dean Leland E. Call accompanied them.

Other recent visitors were Messrs. Carlos L. Locsin and Federico Ossorio, of Negros, and Salvador Oliveros, '33, acting general manager of the Philippine Sugar Institute. They conferred with the Dean concerning the proposed economic research of the sugar industry in this country.

Professors Valente Villegas and Francisco M. Fronda, both of the Department of Animal Husbandry, have been appointed contributing editors on animal husbandry to the Philippine Journal of Animal Industry.

Dr. Faustino S. Mensalvas spoke on "The role of animal husbandry in the economic development of our country" before the teachers of the District of Umingan, Pangasinan, on February 7, 1953.

The Ranchers' Club had its annual Barn Dance on February 7, 1953, at the Animal Husbandry Hall. A short intermission program included the opening remarks by Querubin M. Dycoco, Governor, a square dance, a short talk, and distribution of certificates by Mr. Amado C. Campos, adviser. Music was furnished by the II MA, AFP Orchestra.

The Freshman Night Program was held on February 21, 1953, at the bonfire grounds. The celebration was highlighted by a torch parade, a short program, the burning of the skull caps, and a barn dance at the Seniors' Social Garden. Jose C. Masibay is the president of the class organization; Dr. Silverio M. Cendaña, the adviser.

The Speech and Dramatics Club presented Guerrero's "Forever" and a skit, "Come Hell or Hiawatha," on February 27, 1953. Sofronio Blando is the president of the club and Professor Nelly Dunglao, the adviser.

On April 6, 1953, Dr. G. O. Ocfemia of the Department of Plant Pathology and Dr. G. C. Kent, visiting professor of plant pathology from Cornell University, inspected for the MSA the progress of the research on cadang-cadang disease of coconut by the Bureau of Plant Industry under Dr. Donald de Leon, Coconut Specialist, at Banao, Guinobatan, Albay. They returned to the College on April 10, 1953.

On April 27, 1953, Dr. Ocfemia and Dr. Kent went to Davao, Mindanao, to see for the MSA the actual state of the abacá mosaic campaign there. They were accompanied by Faustino Q. Otanes, chief of the plant pest and disease control service of the Bureau of Plant Industry. This visit by unbiased people was necessary because of conflicting reports on the results of the campaign appearing in the Manila newspapers. The reports made by Drs. Kent and Ocfemia furnished the MSA with an accurate appraisal of the results of the campaign against the abacá mosaic.

On their return to Manila, the two plant pathologists stopped in Negros Occidental because Dr. Ocfemia had been invited by the acting manager of the Philippine Sugar Institute for Mr. Carlos L. Locsin, Technical Vice-President of the Victorias Milling Company, to see the sugarcane diseases prevalent in the estate during the season. They returned to the College on May 2, 1953.

Dr. Amando M. Dalisay, '37, executive secretary of PHILCUSA, Mr. Dominador Z. Rosell, '28, and Mr. Pedro A. Rodrigo, 21, were elected members of the National Research Council of the Philippines.

Mr. Alejandro R. Apacible, '34, and Mr. Leandro R. Lopez, '36, both of the Philippine Sugar Institute, are conducting experiments on the campus in cooperation with several members of the College staff.

Mr. Albino P. Varona, '29, and Mr. Roberto E. Fronda, '50 have joined the Irrigation Service Unit, DANR. Mr. Varona was formerly an instructor in this College and Mr. Fronda, a teacher at the Roxas Memorial Agricultural School in Albay.

Mr. Eduardo A. Artiaga, '47, is at present registrar of the Blessed Trinity High School in Talibon, Bohol. In a letter to Dr. Francisco Fronda, he stated that he is also going to engage in farming and poultry and livestock raising on his farm near the town.

Mr. Cecilio Cornelia, '42, is at present with the Bureau of Agricultural Extension in Negros Oriental. He was formerly teaching at the Negros Oriental High School.

Mr. Cornelio C. Magbanua, '46, of Balamban, Cebu, passed the bar examination given last year.

Messrs. Stephen F. Chadwick and David L. Grove, members of the Belgrano Mission, visited the campus on March 6, 1953. They were accompanied by Dean Leland E. Call, Mr. Ray Johnson, and Mr. Frank S. Miller.

Another recent campus visitor was Dr. J. Joe Reed, of the MSA, Washington, accompanied by Mr. Paul A. Gantt, of the STEM, Manila, on March 25, 1953.

Ex-Governor Adlai Stevenson, accompanied by Dr. Roland Renne, chief of the STEM, Manila, Prof. Walter Johnson, of the University of Chicago, and Mr. John V. Hepler, visited the campus on March 30, 1953.

Dr. George C. Kent discussed the research program of the Department of Plant Pathology, Cornell University, Ithaca, New York, USA, at a regular meeting of the Los Baños Biological Club on February 27, 1953, at the Chemistry Lecture Hall.

At the regular scientific meeting of the Los Baños Biological Club on March 27, 1953, Dr. Herbert K. Hayes read a paper on the pure-seeds program in Minnesota, USA. Kodachrome slides were projected on the screen.

The College Lettermen Day was held on March 19, 1953, at the Baker Memorial Hall. Medals were awarded to Rudy Obordo, Sydney Moresto, Frederick Anoongos, and Joseto Cabon for copping places in the National Open Track and Field meet. College letters were given to deserving athletes of the year. Other features of the affair were folk dances, *Tinikling, La Jota,* and *Salakot,* by the P. E. girls under Miss Lualhati D. Yñiguez; the presentation of the General Championship Cup to Class '54 and awarding of pennants to champions in the various group games by Dean L. B. Uichanco; and closing remarks by Prof. A. B. Catambay.

The collegiate students of the San Ildefonso Junior Colleges, Tanay, Rizal, accompanied by two members of their faculty, visited the Department of Agricultural Botany on March 9, 1953. Dr. José M. Capinpin and Miss Filomena Fortich gave instructions and demonstrations on plant microtechniques.

The Diwa at Panitik Club of the UP Rural High School sponsored a program and declamation contest in the National Language on March 27, 1953, in celebration of National Language Week. Director Cirio H. Panganiban was the guest of honor. Miss Patrocinio V. Santos, adviser of the club, introduced the guest speaker. Aniceto Malabanan copped the first place; Elvira Paelmo, second; Leodegario Ilag, third; and Eva Bondoc, fourth. Medals and prizes donated by the Magcases, Mr. and Mrs. Moises Carandang, Mr. and Mrs. Ceferino Ico, and Mayor Aurelio Almazan were awarded to the winners.

Two alumni of this College head the two divisions in the Office of Economic Affairs, Department of Foreign Affairs. Mr. Trinidad Alconcel, '38, is the chief of the Division of Trade Promotion and Consular Documentation, and Mr. Agustin P. Mañgila, '39, heads the Division of Agricutural, Commercial, Monetary, and Industrial Affairs.

Mr. Cenon R. Flor Cruz, '35, is now with the Philippine Sugar Institute. He was formerly the director of Industrial Development, PHILCUSA.

Mr. Marciano A. Aquino, A.A., '49, of the Bureau of Plant Industry, Zamboanga City, was a recent campus visitor.

Other alumni who visited the campus recently were Mr. Romeo P. Martinez, '43, and Mr. Carlos G. Valdez, '52. They were on their way to their new assignment on the abacá development project at Bago, Davao City.

Sad news has been received from Dr. Edwin Bingham Copeland, founder and first dean of the College, that Mrs. Copeland passed away on March 19, 1953, in Berkeley, California. Mrs. Copeland's "dearest memories were of the early days of the College, and the boys of those days were the dearest to her next to her own family." With her demise, the College community has "lost a zealous, long-tried friend." To express their heartfelt condolence, the members of the College faculty offered, in her memory, a minute-prayer during the faculty meeting on March 31, 1953.

The College faculty gave a combined *bienvenida* and *despedida* party on March 29 in honor of Assistant Dean and Assistant Director F. O. Santos, Dr. F. M. Fronda, Professor E. de la Cruz, of the College of Forestry, and Dr. F. M. Sacay. Doctor Santos and Prof. Cruz returned recently from inspection trips abroad under the auspices of the MSA technical assistance program. Doctor Fronda spent one year in Thailand as poultry expert in the employ of FAO. Doctor Sacay enplaned for the United States on March 30, 1953, to observe

the latest trends in agricultural education as an MSA-PHILCUSA trainee.

A delegation representing Southeast Asian countries visited the different College departments on April 10, 1953. The delegates were on a study tour in the Far East under the auspices of the ILO. After the luncheon given in their honor, Dean Uichanco enlightened the visitors on various aspects of the work and organization of the College. Accompanying the delegation were Dr. Gilbert S. Perez, Mr. Hilario J. Santos, and Mr. Federico Piedad, of the Bureau of Public Schools; and Mr. Clovis R. Wilkey, agricultural education specialist of the MSA.

The members of the College faculty unanimously approved to form a Faculty Club in a meeting on March 31, 1953. Elected officers of the club were Dr. A. G. Tan, president; Prof. A. B. Catambay, vice-president and manager; and Miss F. O. Fortich, secretary-treasurer.

The UP Rural High School held its twenty-second graduation exercises on April 11, 1953, with Mr. Ray G. Johnson, director of the MSA agricultural division, as commencement speaker. Prof. G. F. Saguiguit, principal, presented the members of the graduating class. Dean Uichanco awarded the diplomas to fourteen boys and eleven girls. Violeta R. Cendaña was the valedictorian and Conchita D. Yñiguez, honorable mention in the girls' curriculum; Godofredo C. Eala and Benito A. Lit were the honor students in the boys' curriculum. Special certificates were awarded to Benito Lit, champion junior farmer; Roberto A. Monserrat, champion plowman and champion general crop grower; Jesus L. Alejandrino, champion poultry raiser; and Ponciano A. Maligalig, champion gardener.

The UP Rural High School Day was celebrated on April 9, 1953. Vocational and Boy Scout contests, military drill competition, and mass folk dancing were the main features of the program.

Mr. Hilario J. Santos, '36, is acting chief of the vocational education division, Bureau of Public Schools.

Mr. Jose C. Saddul, '32, has recently been conferred the degree of Doctor of Philosophy at the Centro Escolar University. His doctorate thesis deals with the agricultural education program in the Philippines. Mr. Saddul is also the holder of a Master's degree from Louisiana State University.

Messrs. Justo C. Gonzales, Jr., '44, Ambrosio H. Ramos, '41, and Zacarias V. Valdez, '44, have been selected trainees in pest and weed control under the Colombo Plan. Messrs. Gonzales and Ramos left for London last March. Mr. Valdez is scheduled to leave later via the United States.

Fifty-three members of the Class of 1953 of the College were conferred the degree of Bachelor of Science in Agriculture on April

14, 1953. The new alumni are as follows: Filomeno M. Agrupis, Godofredo N. Alcasid, Jr., Isabelo A. Amurao, Elfren N. Aquino, Dimna V. Avila, Perfecta L. Barile, Margarita P. Bawagan, Faro B. Benitez, Pedro S. Cariaga, Beatriz A. Castro, Marcelo V. Catalan, Lydia A. Clemente, Elpidio C. Coligado, Crispulo S. Constantino, Igmidio T. Corpuz, Marcelo P. Cruz, (degree awarded posthumously), Pablo B. Dignadice, Dionisio M. Dychioco, Jr., Alfredo L. Eloja, Emmanuel M. Estacion, Romualdo V. Eusebio, Demetria B. Fernandez, Regino B. Fernandez, Celso S. Gonzales, Onofre J. Griño, Jr., Efrain C. Guanco, Isidoro M. Jose, Teodoro V. Katigbak, Amado F. Lomibao, Marciano B. Lopez, Raul L. Lopez, Arturo P. Manloñgat, Lino E. Nazareno, Marcos M. Nuestro, Miguel P. Palao, Richard Pang, Domingo B. Protacio, Sebastian S. Quiniones, Reynalda C. Ramos, Domiciano E. Raymundo, Basilio N. de los Reyes, Victoriano J. Rodriguez, Corazon P. Salamat, Maximino P. Sanchez, Ibarra S. Santos, Rufino L. Santos, Ludovico N. Tayag, Marcelino P. Toledo, Ruperto A. Villanoy, Irving P. Villasor, and Lorenzo C. Zuñiga.

Also awarded the Certificate in Agricultural Education were Filomeno M. Agrupis, Richard Pang, Victoriano J. Rodriguez, and Jose R. Deanon, Jr.

The following were granted the title of Associate in Agriculture: Jesus Y. Alo, Agustin F. Cabebe, Ramon C. Fabie, Victor E. Millare, Pablito B. Picardal, Bonifacio Q. Valdez, and Camilo D. Ventura.

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